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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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INTRODUCTION

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IAA is available on subscription from the American Institute of Aeronautics and Astronautics, Technical Information Service, 750 Third Avenue, New York, NY 10017, at the following annual rates:

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The Preliminary Edition of the *NASA Thesaurus* (December 1967) (NASA SP-7030) is used as the authority for the indexing vocabulary that appears in the subject index. The *NASA Thesaurus* should be consulted in examining the current indexing vocabulary, including associated cross-reference structure. Only the subject terms that have been selected to describe the documents abstracted in this issue appear in the subject index. Copies of the *NASA Thesaurus* may be obtained from the National Technical Information Service or the U.S. Government Printing Office at $8.50 for the three-volume set. The first two volumes of this Thesaurus, consisting of the alphabetical listing of subject terms (A–Z), have been superseded by the following single-volume publication: *NASA Thesaurus Alphabetical Update* (September 1971) (NASA SP-7040), available from NTIS for $6.00. (Volume III of the Preliminary Edition consists of the following ancillary aids to vocabulary selection: heirarchical display of index terms, category term listing, permuted index, and a listing of postable terms only.)

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Includes aerodynamics of bodies, combinations, internal flow in ducts and turbomachinery; wings, rotors, and control surfaces. For applications see: 02 Aircraft and 32 Space Vehicles. For related information see also: 12 Fluid Mechanics; and 33 Thermodynamics and Combustion.

02 Aircraft 1963
Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc.; and specific types of complete aircraft (e.g., ground effect machines, STOL, and VTOL); flight tests; operating problems (e.g., sonic boom); safety and safety devices; economics; and stability and control. For basic research see: 01 Aerodynamics. For related information see also: 31 Space Vehicles; and 32 Structural Mechanics.

03 Auxiliary Systems 1967
Includes fuel cells, energy conversion cells, and solar cells; auxiliary gas turbines; hydraulic, pneumatic and electrical systems; actuators; and inverters. For related information see also: 09 Electronic Equipment; 22 Nuclear Engineering; and 28 Propulsion Systems.

04 Biosciences 1970
Includes aerospace medicine, exobiology, radiation effects on biological systems; physiological and psychological factors. For related information see also: 05 Biotechnology.

05 Biotechnology 1975
Includes life support systems, human engineering; protective clothing and equipment; crew training and evaluation, and piloting. For related information see also: 04 Biosciences.

06 Chemistry 1982
Includes chemical analysis and identification (e.g., spectroscopy). For applications see: 17 Materials, Metallic; 18 Materials, Nonmetallic; and 27 Propellants.

07 Communications 1984
Includes communications equipment and techniques; noise; radio and communications blackout; modulation telemetry; tracking radar and optical observation; and wave propagation. For basic research see: 23 Physics, General; and 21 Navigation.

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08 Computers 1991
Includes computer operation and programming; and data processing. For applications, see specific categories. For related information see also: 19 Mathematics.

09 Electronic Equipment 2002
Includes electronic test equipment and maintainability; component parts, e.g., electron tubes, tunnel diodes, transistors, integrated circuitry; microminiaturization. For basic research see: 10 Electronics. For related information see also: 07 Communications and 21 Navigation.

10 Electronics 2005
Includes circuit theory; and feedback and control theory. For applications see: 09 Electronic Equipment. For related information see specific Physics categories.

11 Facilities, Research and Support 2007
Includes airports; lunar and planetary bases including associated vehicles; ground support systems; related logistics; simulators; test facilities (e.g., rocket engine test stands, shock tubes, and wind tunnels); test ranges; and tracking stations.

12 Fluid Mechanics 2010
Includes boundary-layer flow; compressible flow; gas dynamics; hydrodynamics; and turbulence. For related information see also: 01 Aerodynamics; and 33 Thermodynamics and Combustion.

13 Geophysics 2015
Includes aeronomy; upper and lower atmosphere studies; oceanography; cartography; and geodesy. For related information see also: 20 Meteorology; 29 Space Radiation; and 30 Space Sciences.

14 Instrumentation and Photography 2025
Includes design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gages; recorders, transducers; aerial photography; and telescopes and cameras.

15 Machine Elements and Processes 2032
Includes bearings, seals, pumps, and other mechanical equipment; lubrication, friction, and wear; manufacturing processes and quality control; reliability; drafting; and materials fabrication, handling, and inspection.

16 Masers 2036
Includes applications of masers and lasers. For basic research see: 26 Physics, Solid-State.

17 Materials, Metallic 2038
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18 Materials, Nonmetallic 2043
Includes corrosion; physical and mechanical properties of materials (e.g., plastics); and elastomers, hydraulic fluids, etc. For basic research see: 06 Chemistry. For related information see also: 17 Materials, Metallic; 27 Propellants; and 32 Structural Mechanics.

19 Mathematics 2045
Includes calculation methods and theory; and numerical analysis. For applications see specific categories. For related information see also: 08 Computers.

20 Meteorology 2048
Includes climatology; weather forecasting; and visibility studies. For related information see also: 13 Geophysics; and 30 Space Sciences.

21 Navigation 2051
Includes guidance; autopilots; star and planet tracking; inertial platforms; and air traffic control. For related information see also: 07 Communications.

22 Nuclear Engineering 2053
Includes nuclear reactors and nuclear heat sources used for propulsion and auxiliary power. For basic research see: 24 Physics, Atomic, Molecular, and Nuclear. For related information see also: 03 Auxiliary Systems; and 28 Propulsion Systems.

23 Physics, General 2056
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24 Physics, Atomic, Molecular, and Nuclear 2059
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Includes semiconductor theory; and superconductivity. For applications see: 16 Masers. For related information see also: 10 Electronics.

27 Propellants 2069
Includes fuels; igniters; and oxidizers. For basic research see: 06 Chemistry; and 33 Thermodynamics and Combustion. For related information see also: 28 Propulsion Systems.

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28 Propulsion Systems 2070
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29 Space Radiation 2073
Includes cosmic radiation; solar flares; solar radiation; and Van Allen radiation belts. For related information see also: 13 Geophysics, and 24 Physics, Atomic, Molecular, and Nuclear.

30 Space Sciences 2075
Includes astronomy and astrophysics; cosmology; lunar and planetary flight and exploration; and theoretical analysis of orbits and trajectories. For related information see also: 11 Facilities, Research and Support; and 31 Space Vehicles.

31 Space Vehicles 2083
Includes launch vehicles; manned space capsules; clustered and multistage rockets; satellites; sounding rockets and probes; and operating problems. For basic research see: 30 Space Sciences. For related information see also: 28 Propulsion Systems; and 32 Structural Mechanics.

32 Structural Mechanics 2086
Includes structural element design and weight analysis; fatigue; thermal stress; impact phenomena; vibration; flutter; inflatable structures; and structural tests. For related information see also: 17 Materials, Metallic; and 18 Materials, Nonmetallic.

33 Thermodynamics and Combustion 2089
Includes ablation, cooling, heating, heat transfer, thermal balance, and other thermal effects; and combustion theory. For related information see also: 12 Fluid Mechanics; and 27 Propellants.

34 General 2092
Includes information of a broad nature related to industrial applications and technology, and to basic research; defense aspects; information retrieval; management; law and related legal matters; and legislative hearings and documents.

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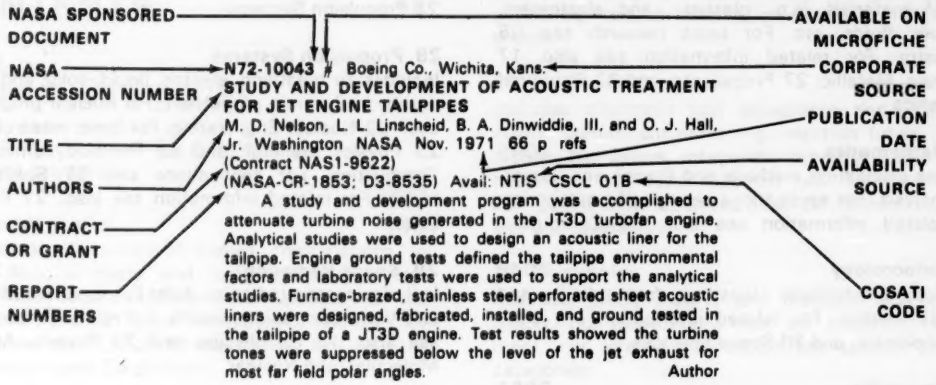
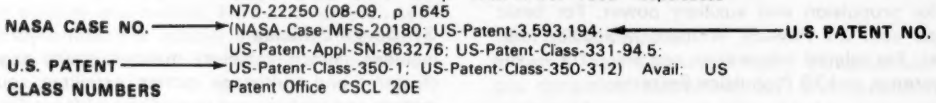


N72-10043 # Boeing Co., Wichita, Kans.
STUDY AND DEVELOPMENT OF ACOUSTIC TREATMENT FOR JET ENGINE TAILPIPES
M. D. Nelson, L. L. Linscheid, B. A. Dinwiddie, III, and O. J. Hall, Jr. Washington NASA Nov. 1971 66 p refs
(Contract NAS1-9622)
(NASA-CR-1853; D3-8535) Avail: NTIS CSCL 01B

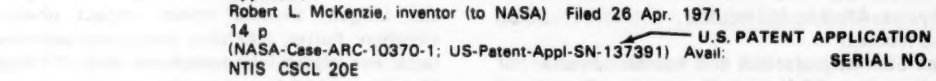
A study and development program was accomplished to attenuate turbine noise generated in the JT3D turbofan engine. Analytical studies were used to design an acoustic liner for the tailpipe. Engine ground tests defined the tailpipe environmental factors and laboratory tests were used to support the analytical studies. Furnace-brazed, stainless steel, perforated sheet acoustic liners were designed, fabricated, installed, and ground tested in the tailpipe of a JT3D engine. Test results showed the turbine tones were suppressed below the level of the jet exhaust for most far field polar angles. Author

PATENT CITATION



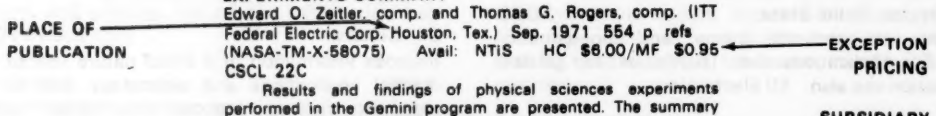
N72-12440* Auburn Research Foundation, Inc., Ala.
LASER COOLANT AND ULTRAVIOLET FILTER Patent
John R. Rasquin and Fred R. McDevitt, inventors (to NASA)
Issued 13 Jul. 1971 14 p Filed 2 Oct. 1969 Supersedes N70-22250 (08-09, p 1645
(NASA-Case-MFS-20180; US-Patent-3,593,194; US-Patent-Appl-SN-863276; US-Patent-Class-331-94.5; US-Patent-Class-350-1; US-Patent-Class-350-312) Avail: US Patent Office CSCL 20E

PATENT APPLICATION CITATION



N72-10432*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DIATOMIC INFRARED GASDYNAMIC LASER Patent Application
Robert L. McKenzie, inventor (to NASA) Filed 26 Apr. 1971 14 p
(NASA-Case-ARC-10370-1; US-Patent-Appl-SN-137391) Avail: NTIS CSCL 20E

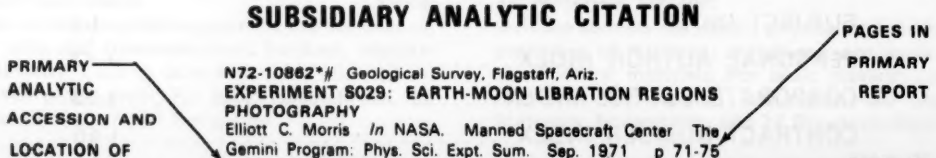
PRIMARY ANALYTIC CITATION AND ABSTRACT



N72-10856*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
THE GEMINI PROGRAM: PHYSICAL SCIENCES EXPERIMENTS SUMMARY
Edward O. Zeitler, comp. and Thomas G. Rogers, comp. (ITT Federal Electric Corp. Houston, Tex.) Sep. 1971 554 p refs
(NASA-TM-X-58075) Avail: NTIS HC $6.00/MF $0.95 CSCL 22C

Results and findings of physical sciences experiments performed in the Gemini program are presented. The summary contains descriptions of selected studies in the fields of astronomy, navigation, radiation, geophysics, meteorology, photography, and communications. For individual titles, see N72-10857 through N72-10891.

SUBSIDIARY ANALYTIC CITATION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N72-10862*# Geological Survey, Flagstaff, Ariz.
EXPERIMENT S029: EARTH-MOON LIBRATION REGIONS PHOTOGRAPHY
Elliott C. Morris *In* NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 71-75
(See N72-10856 01-30)
Avail: NTIS HC $6.00/MF $0.95 CSCL 14E

VOLUME 10 NUMBER 15 / AUGUST 8, 1972

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERODYNAMICS

Includes aerodynamics of bodies, combinations, internal flow in ducts and turbo machinery; wings, rotors, and control surfaces. For applications see: 02 Aircraft and 31 Space Vehicles. For related information see also: 12 Fluid Mechanics; and 33 Thermodynamics and Combustion.

N72-23991*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.

THE ROLE OF FLUCTUATING FORCES IN THE GENERATION OF COMPRESSOR NOISE

Hanno H. Heller and Sheila E. Widnall Washington NASA May 1972 112 p refs

(Contract NAS1-9883)

(NASA-CR-2012; Rept-2160) Avail: NTIS HC $3.00 CSCL 01A

The results of a theoretical and experimental study on the role of aerodynamically-induced fluctuating forces in the sound generation by axial-flow compressors are presented. Analytical models for the generation and radiation of sound by rotor/stator combinations were developed. For the experimental substantiation of the analytical results, the technology was developed to measure fluctuating forces directly on rotating airfoils using miniature differential-pressure sensors and FM telemetry. Under the assemption of full coherence of the force field on the blade, radiated sound power was predicted from the force measurements on blades and compared with measured sound power. Both broadband radiation from a single rotating airfoil and discrete frequency radiation due to interaction of multi-bladed stator/rotor configurations were investigated. The results indicate the necessity to obtain information on the details of the force field for accurate prediction of the radiated sound spectrum. Author

N72-23992*# Martin Marietta Corp., Baltimore, Md. Research Inst. for Advanced Studies.

EXPERIMENTAL INVESTIGATION OF HYPERSONIC BUZZ ON A HIGH CROSS-RANGE SHUTTLE CONFIGURATION

Robert L. Goldman and Henry J. Obremski May 1972 44 p refs

(Contract NAS1-10726)

(NASA-CR-112053; RIAS-TR-72-05C) Avail: NTIS HC $4.25 CSCL 01A

A wind tunnel investigation has been conducted to determine the nature of an unsteady hypersonic flow phenomenon, often referred to as hypersonic buzz, on a 1:100 scale model representative of a high cross-range shuttle configuration. The tests, conducted in helium at a nominal Mach number of 17.5, were specifically directed at obtaining a better understanding of the character of the hypersonic flow field in the vicinity of a deflected control surface. Power spectral densities and root mean squared values of surface pressure fluctuations are presented along with observations made from high speed motion pictures, schlieren and oil flow photographs. Flap deflections of 0, 20, 30, 35, 40 and 60 deg were tested at various angles of attack from 0 deg to 37 deg. It is quite clear from these tests that, under certain conditions, extremely unstable hypersonic flow patterns are formed. Author

N72-23993*# Massachusetts Inst. of Tech., Cambridge. Aeroelastic and Structures Research Laboratory.

QUALITATIVE RESPONSES OF A VORTEX CORE TO TIP BLOWING AND INTERSECTING AIRFOILS

H. L. Kantha, W. S. Lewellen, and F. H. Durgin Aug. 1971 52 p refs

(Grant NGR-22-009-303)

(NASA-CR-126675; ASRL-TR-153-4) Avail: NTIS HC $4.75 CSCL 01A

The qualitative responses of a trailing vortex core to change in its convective velocity produced by injection of air into the vortex core and by the flow field of a lifting surface in the path of the core are discussed. Flow pictures of the vortex core and vorticity measurements in the core show that an axial momentum injection of approximately 35% of the total wing drag alters the vortex structure and behavior quite drastically by effectively inducing a more rapid dispersion of the vorticity in the core. The data indicate that the phenomenon is governed by the rate of injection of the momentum rather than the mass flow rate. There also seems to be an optimum rate of injection beyond which increased injection does not bring about equally significant changes in the vortex core. Flow patterns of the region of interaction between the flow field of a lifting surface and the vortex core show two modes of vortex response; (1) the vortex core bends, following the streamline shape until it intercepts the wake of the wing where it is abruptly dispersed, or (2) the vortex core may be sliced into two similar vortices when the vortex hits the leading edge of the wing. Author

N72-23994*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

WIND TUNNEL TEST DATA FOR WING TRAILING VORTEX FLOW SURVEY

N. A. Chigier and V. R. Corsiglia May 1972 94 p refs

(NASA-TM-X-62148) Avail: NTIS HC $6.75 CSCL 01A

Data are presented on velocity measurements made with hot wire anemometers in the wake of a model of the CV-990 aircraft and a rectangular wing in the NASA-Ames 2.14x3.05 meter (7- by 10-foot) wind tunnels. Variables included angle of attack, tunnel speed and axial distance up to 12 chord lengths downstream from the wing trailing edge. Effects of deflecting trailing edge flaps and small spoiler panels are shown. Author

N72-23995*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

CALCULATION OF LAMINAR HEAT TRANSFER TO THE

WINDWARD SURFACES OF STRAIGHT WING SHUTTLE VEHICLES AT HIGH ANGLE OF ATTACK AND WITH YAW
C. C. Pappas Washington May 1972 19 p refs
(NASA-TN-D-6614; A-4196) Avail: NTIS HC $3.00 CSCL 01A

Calculations of laminar heat transfer to windward wing and body surfaces of a straight wing MSC orbiter have been made at high angles of attack and with yaw. The predictions of heat transfer made by swept cylinder theory generally agree with measurements in areas free of external flow interference. An optimum elliptic cross section was then determined using swept cylinder theory for an aerodynamically heated windward body surface in radiation equilibrium. Author

N72-23996*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EFFECTS OF BODY SHAPE ON THE AERODYNAMIC CHARACTERISTICS OF AN ALL-BODY HYPERSONIC AIRCRAFT CONFIGURATION AT MACH NUMBERS FROM 0.65 TO 10.6
Walter P. Nelms, Jr. Washington May 1972 61 p refs
(NASA-TN-D-6821; A-4297) Avail: NTIS HC $3.00 CSCL 01A

An experimental investigation was conducted to determine the effects of several variations in body shape on the aerodynamic characteristics of an all-body hypersonic aircraft configuration. The basic configuration had a delta planform with an elliptic cone forebody and an afterbody of elliptic cross section terminating in a straight-line trailing edge. Variations in body shape included the ratio of maximum cross-sectional to body planform area, body leading-edge sweep, and forebody length ratio. In addition, the effects of a thin wing mounted on one of the bodies was investigated, and the aerodynamic characteristics of just the forebodies of two of the configurations were determined. The models had no stabilizing surfaces or propulsion system packages. Ranges of angle of attack (-4 deg to +15 deg) and angle of sideslip (-4 deg to +8 deg) were investigated. Of the four complete bodies, the configuration with the lowest ratio of cross-sectional to body planform area had the highest maximum lift-drag ratio and the greatest level of longitudinal stability at most Mach numbers. All the configurations had positive longitudinal stability near maximum lift-drag ratio at most Mach numbers. With exception of the lowest subsonic Mach numbers, changes in body sweep angle and in forebody length ratio had only minor effects on maximum lift-drag ratio. Author

N72-23997*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
NORMAL IMPINGEMENT LOADS DUE TO SMALL AIR JETS ISSUING FROM A BASE PLATE AND REFLECTING OFF A PLATFORM FOR VARIOUS JET MACH NUMBERS, SEPARATION DISTANCES, AND AMBIENT PRESSURES
Sherwood Hoffman Washington Jun. 1972 25 p refs
(NASA-TN-D-6817; L-8356) Avail: NTIS HC $3.00 CSCL 12D

An investigation was conducted in a 12.5-meter-diameter vacuum sphere to determine the impingement loads due to air jets issuing from and perpendicular to a circular base and reflecting off a square platform, that is, a simulation of rendezvous maneuvering, docking, launch, impact dampers etc. The nozzles had exit Mach numbers of 1, 3, 5, and 7. The ambient pressures were 0.0006, 5, 225, and 760 torr. Under near-field separation distances and at 0.0006 torr, reflections were significant; and ratios of the impingement force to thrust on both plates in the biplane arrangement varied from about 750 for exit Mach number 1 to 120 for exit Mach number 7. The far-field force ratios were near unity for the platform and zero for the base and indicated few, if any, reflections. Some reversals and rapid changes in loads were obtained at transition distances between the near and far fields. In general, increasing the exit Mach number or ambient pressure reduced the impingement loads. Author

N72-23998*# Virginia Univ., Charlottesville. Research Labs. for the Engineering Sciences.
BOUNDARY LAYER STABILITY ON A YAWED SPINNING BODY OF REVOLUTION AND ITS EFFECT ON THE MAGNUS FORCE AND MOMENT
I. D. Jacobson and J. B. Morton Washington NASA Jun. 1972 36 p refs
(Grant NGR-47-005-149)
(NASA-CR-2060; AEEP-4089-101-71U) Avail: NTIS HC $3.00 CSCL 01A

The parameters are established which are important to the stability of a boundary layer flow over a yawed spinning cylinder in a uniform stream. It is shown that transition occurs asymmetrically in general and this asymmetry can be important for the prediction of aerodynamic forces and moments (e.g., the Magnus effect). Instability of the steady-state boundary layer flow is determined using small disturbance theory. Although the approach is strictly valid only for the calculation of the conditions for stability in the small, experimental data indicate that in many problems, it provides a good estimate for the transition to turbulence. Author

N72-23999# Tokyo Univ. (Japan). Inst. of Space and Aeronautical Science.
NUMERICAL CALCULATIONS OF SOME COMPLICATED AERODYNAMIC PROBLEMS BY A TIME-DEPENDENT FINITE-DIFFERENCE METHOD
Naoki Hirose Jan. 1972 53 p refs
(ISAS-475-Vol-37-No-1) Avail: NTIS HC $4.75

A time dependent finite difference method known as fluid-in-cell method was applied to the inviscid compressible flow problems containing such unknown discontinuities as shock wave and contact surface for the purpose of investigating the transient unsteady flow behaviour and the resulting asymptotic steady flow field as well without making any specific assumptions on the position and the strength of those discontinuities. The problems treated were: (1) supersonic flow past a circular cylinder perpendicular to the main stream; (2) supersonic flow around a flat-faced circular cylinder parallel to the main stream; and (3) supersonic flow around a flat-faced circular cylinder with a supersonic opposing jet from the nose. The results of the numerical calculation for cases (1) and (2) showed close agreement with those of the existing theories and experiments. It was also shown that, in case (1), the method of calculation can be successfully extended to the plane polar coordinate system. In case (3), it was clear that the present method of numerical calculation can produce sufficient information to investigate the highly complicated flow field induced by the opposing jet.
Author

N72-24000# Addis Translations International, Woodside, Calif.
GAS DYNAMICS OF THE FLIGHT AND EXPLOSION OF METEORITE BODIES IN THE EARTH'S ATMOSPHERE
V. P. Korobeinikov, P. L. Chushkin, and L. V. Shurshalov Nov. 1971 30 p refs Transl. into ENGLISH of "Gazodinamika poleta i vzryva meteoritnykh tel v atmosfere Zemli", Russian conf. paper, Sep. 1971 22 p Presented at 3d Intern. Colloq. on the Gas Dyn. of Explosions, Marseilles, 12-17 Sep. 1971 Prepared for Calif. Univ., Livermore. Lawrence Livermore Lab. Sponsored by AEC
(UCRL-Trans-10572; Conf-710918-2) Avail: NTIS

The aerodynamic properties of blunt bodies moving at hypersonic velocities in the atmosphere are discussed, and a model of the explosion of meteorites is investigated. The explosion of the Tungusska meteorite, which took place in Siberia on June 30, 1908 is used as an example. NSA

N72-24001# Boeing Co., Philadelphia, Pa. Vertol Div.
WIND TUNNEL TEST OF A POWERED TILT-ROTOR PERFORMANCE MODEL, VOLUME 5 Final Report, Jun. Dec. 1970
John P. Magee, Robert B. Taylor, Frank J. McHugh, Nelson Miller, and Leon N. DeLarm Oct. 1971 510 p

(Contract F33615-69-C-1577)
(AD-736824; D213-10000-5; AFFDL-TR-71-62-Vol-5) Avail: NTIS CSCL 01/3

Wind tunnel test data obtained with a full span, two prop, tilt rotor, powered model are reported. Data were taken in hover, transition and cruise flight conditions and include performance, stability and control and blade loads information. The effects of the rotors, tail surfaces and airframe on the performance and stability are isolated as are the effects of the airframe on the rotors. Predicted rotor frequencies were verified, both static and rotating, and since they influence rotor response characteristics, correlation for stability and blade load data is included. Author (GRA)

N72-24002# Boeing Co., Philadelphia, Pa. Vertol Div.
WIND TUNNEL TEST OF THE AERODYNAMICS AND DYNAMICS OF ROTOR SPINUP, STOPPING AND FOLDING ON A SEMISPAN FOLDING TILT ROTOR MODEL, VOLUME 7 Final Report, Jan. - Jul. 1971
Dirk VanWagensveld, Frank J. McHugh, Leon N. DeLarm, Walter L. Lapinski, and John P. Magee Oct. 1971 408 p
(Contract F33615-69-C-1577)
(AD-736825; D213-10000-7; AFFDL-TR-71-62-Vol-7) Avail: NTIS CSCL 01/3

Wind tunnel test data obtained with a 1/9-scale semispan, unpowered, dynamically-scaled Model 213 stowed/tilt rotor are reported. The objectives of the tests were to obtain aerodynamic, structural, and dynamics data during the spinup, feather and blade fold cycles of this vehicle. Author (GRA)

N72-24003# Douglas Aircraft Co., Inc., Long Beach, Calif. Aerodynamics Research.
A GENERAL CLASS OF AIRFOILS CONFORMALLY MAPPED FROM A CIRCLE
Richard M. James 27 May 1971 92 p refs
(Contract F44620-70-C-0108; AF Proj. 9781)
(AD-738318; MDC-J5108; AFOSR-72-0370TR) Avail: NTIS CSCL 20/4

Exact or analytical solutions for flows about airfoils displaying certain prescribed features may require a special program incorporating many different features. To avoid unnecessary labor and simplify a much abused background of traditional 'exact' airfoils, the report presents a general mapping procedure and account of the supporting theory. Special features needed for a computer program and to describe limiting behavior are included for zero trailing-edge angle. In addition, a capability for generating exact solutions in the presence of an isolated external vortex simulating a slat is described and illustrated briefly. GRA

N72-24004# Iowa Univ., Iowa City. Dept. of Mechanics and Hydraulics.
PROCEEDINGS OF THE THEMIS SYMPOSIUM ON VEHICULAR DYNAMICS
W. F. Ames, ed. and A. Hammer, ed. (Army Weapons Command) 14 Feb. 1972 463 p refs Symp. held at Rock Island Arsenal, Rock Island, Ill., 11-12 Nov. 1971 Sponsored by Army
(AD-738191) Avail: NTIS CSCL 01/1

The rational design of complex vehicular systems involves a substantial number of simultaneous interrelated decisions and a combination of sophisticated engineering and analytical disciplines. The symposium served as one forum for the presentation and discussion of ongoing research on the dynamics of various mechanisms. Lectures were presented on such topics as flutter phenomena of rotary wings, optimization of structures, air flow over oscillating airfoils, the behavior of layered composites, and weapon system mechanics. GRA

N72-24005# California Inst. of Tech., Pasadena. Dept. of Applied Mathematics.
THE DISCRETE VORTEX APPROXIMATION OF A FINITE VORTEX SHEET
D. W. Moore Oct. 1971 19 p refs
(Grant AF-AFOSR-1804-69; AF Proj. 9781)
(AD-737862; AFOSR-72-0034TR) Avail: NTIS CSCL 01/1

It is shown by examination of a special case of aircraft trailing vortices that the approximation of replacing a finite vortex sheet by an array of line vortices can be unreliable, regardless of how many vortices are used. GRA

02 AIRCRAFT

Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc; and specific types of complete aircraft (e.g., ground effect machines, STOL, and VTOL); flight tests; operating problems (e.g., sonic boom); safety and safety devices; economics; and stability and control. For basic research see: 01 Aerodynamics. For related information see also: 31 Space Vehicles; and 32 Structural Mechanics.

N72-24006 Stanford Univ., Calif.
SECOND-ORDER SINGULAR ARCS IN TRAJECTORY OPTIMIZATION Ph.D. Thesis
John Frederick Dixon 1971 101 p
Avail: Univ. Microfilms Order No. 71-23498

The basic features of singular optimal control are explained briefly and the order of singularity is defined. As an example of the second-order junction phenomenon an analysis of an unsymmetrical version of the Fuller problem is presented. The surprisingly complex solution of this problem calls for the optimal control to alternate between the control bounds with a frequency which becomes infinite at an accumulation point as a second-order singular arc is joined. It is shown that only a very slight penalty in cost results if the infinite sequence of control switches is terminated after the first few switches in favor of a convenient suboptimal policy. It is demonstrated that a second-order singular arc appears in the solution of a minimum time ascent problem for supersonic aircraft, with thrust and drag treated as functions of altitude and speed only. In this formulation the time rate of change of flight path angle is the control. Intermediate thrust arcs occurring in the study of minimum fuel space trajectories are investigated. Dissert. Abstr.

N72-24007 Elliott-Automation Space and Advanced Military Systems, Ltd., Camberley (England).
AIRCRAFT TRAJECTORY OPTIMISATION USING PONTRYAGIN'S MINIMUM PRINCIPLE
M. W. Winn Mar. 1971 67 p refs
(Contract KV/B/627/CB.64(A))
(ETN-4) Copyright. Avail: Issuing Activity

Theoretical derivation of Pontryagin minimum principles is discussed. A method for numerically solving the differential equations was developed, based on the gradient or steepest descent minimization procedure, incorporating a Runge-Kutta-Gill numerical integration routine. The method is applied to solving: (1) the minimum time heading change of an aircraft and (2) the coplanar minimum time intercept of a target aircraft by a chase aircraft. Author (ESRO)

N72-24008*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PRELIMINARY NOISE TESTS OF THE ENGINE-OVER-THE-WING CONCEPT. I: 30 DEG - 60 DEG FLAP POSITION
Meyer Reshotko, William A. Olsen, and Robert G. Dorsch Mar. 1972 28 p refs
(NASA-TM-X-68032) Avail: NTIS HC $3.50 CSCL 01C

The results of preliminary acoustic tests of the engine over the wing concept are summarized. The tests were conducted with a small wing section model (32 cm chord) having two flaps set at the landing position, which is 30 and 60 deg respectively. The engine exhaust was simulated by an air jet from a convergent nozzle having a nominal diameter of 5.1 centimeters. Factors investigated for their effect on noise include nozzle

location, wing shielding, flap leakage, nozzle shape, exhaust deflectors, and internally generated exhaust noise. Author

N72-24009*# National Aeronautics and Space Administration, Washington, D.C.
TU-144 ON THE AIR LANES Transl. into ENGLISH from Grazhdanskaya Aviatsiya (Moscow), no. 1, 1972 p 16-17
A. Kraminov May 1972 5 p
(NASA-TT-F-14241) Avail: NTIS HC $3.00 CSCL 01C

An interview with Soviet engineering personnel concerning the performance and characteristics of the TU-144 aircraft is presented. The document consists of subjective opinions of aircraft designers and engineers describing the operation, flight test, and construction of the aircraft. Author

N72-24010*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AERODYNAMIC CHARACTERISTICS OF A LARGE SCALE LIFT FAN TRANSPORT MODEL WITH PODDED FANS FORWARD AND LIFT CRUISE FANS MOUNTED ABOVE THE WING
Jerry V. Kirk, Stanley O. Dickinson, Leo P. Hall, and Mary G. Coffman Apr. 1972 132 p refs
(NASA-TM-X-62151) Avail: NTIS HC $8.75 CSCL 01B

The aerodynamic characteristics of a large scale V/STOL transport model powered by tip-turbine driven lift fans were investigated. The model had four fans; the forward fans were mounted in pods forward of the wing at midsemispan. The aft fans were placed in cruise nacelles behind and above the wing. A cascade of variable camber exit louvers was placed behind each of the lift-cruise fans to turn the fan flow in the lift direction for hover and transition to wing supported flight. The wing of the model was mounted above the fuselage, had an aspect ratio of 5.8, sweepback of 35 deg at the quarter chord line and a taper ratio of 0.3. Various configurations of the model were tested to explore the transition speed range. Fan performance, turning effectiveness of the variable camber exit louvers, longitudinal and lateral-directional characteristics with fan operation in crossflow are presented. Author

N72-24011*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LARGE-SCALE WIND-TUNNEL INVESTIGATION OF THE NOISE CHARACTERISTICS OF A SEMISPAN WING EQUIPPED WITH AN EXTERNALLY BLOWN JET FLAP
Michael D. Falarski May 1972 118 p refs Prepared in cooperation with Army Air Mobility Res. and Develop. Lab.
(NASA-TM-X-62154) Avail: NTIS HC $8.00 CSCL 01B

A wind tunnel investigation was made of the noise characteristics of a 4.42 m(14.5 foot) semispan, externally-blown jet flap model. The model was equipped with a single 76.2 cm(30 inch) diameter, ducted fan with a 1.03 pressure ratio. The effects of flap size, fan vertical location, and forward speed on the noise characteristics were studied. The data from the investigation is presented in the form of tabulated one-third octave band frequency spectrums and perceived noise levels for each test condition. Author

N72-24012*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A FLIGHT EVALUATION OF A VECTORED THRUST JET V/STOL AIRPLANE DURING SIMULATED INSTRUMENT APPROACHES USING THE KESTREL (XV-6A) AIRPLANE
Samuel A. Morello, Lee H. Person, Jr., Robert E. Shanks, and Richard G. Culpepper Washington May 1972 78 p refs
(NASA-TN-D-6791; L-8254) Avail: NTIS HC $3.00 CSCL 01B

An in-flight investigation was made to determine the terminal-area operating problems of a vectored-thrust-jet vertical and short take-off landing (V/STOL) airplane under simulated instrument conditions. Handling-qualities data pertinent to the terminal-area approach and landing task are presented in the text, and additional documentation is included in the appendixes. Problems dealing with the cruise letdown to localizer capture, conversion to powered-lift flight, precise control of the glide slope, approach velocity or deceleration schedule, hover, and landing are discussed. Author

N72-24013*# National Aeronautics and Space Administration, Washington, D.C.
AEROBUS: THE AIRCRAFT OF THE FUTURE (BASIC PROBLEMS OF DESIGNING AIR BUSES)
V. Sheynin May 1972 9 p Transl. into ENGLISH from Grazhdanskaya Aviatsiya, no. 1, 1972 p 24-27
(NASA-TT-F-14240) Avail: NTIS HC $3.00 CSCL 01B

The problems associated with the design of air bus type aircraft are discussed. The primary design problem is identified as the size and weight of the aircraft. Other problems involved in the aircraft configuration are concerned with the cross sectional shape of the fuselage, the location of the engines, accommodations for the passengers, and a compromise on the maximum cruise speed to be permitted during operation. The rationale behind various decisions for the air bus design are explained. Author

N72-24014*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
PERFORMANCE OF AN AIRCRAFT TIRE UNDER CYCLIC BRAKING AND OF A CURRENTLY OPERATIONAL ANTISKID BRAKING SYSTEM
John A. Tanner Washington May 1972 25 p refs
(NASA-TN-D-6755; L-7640) Avail: NTIS HC $3.00 CSCL 01B

An experimental investigation was conducted to study the performance of an aircraft tire under cyclic braking conditions and to study the performance of a currently operational aircraft antiskid braking system. Dry, damp, and flooded runway surface conditions were used in the investigation. The results indicated that under cyclic braking conditions the braking and cornering-force friction coefficients may be influenced by fluctuations in the vertical load, flexibility in the wheel support, and the spring coupling between the wheel and the tire-pavement interface. The cornering capability was shown to be negligible at wheel slip ratios well below a locked-wheel skid under all test surface conditions. The maximum available brake-force friction coefficient was shown to be dependent upon the runway surface condition, upon velocity, and, for wet runways, upon tire differences. Moderate reductions in vertical load and brake system pressure did not significantly affect the overall wet-runway performance of the tire. Author

N72-24015*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ANALYSIS OF VGH DATA FROM TWO TYPES OF FOUR-ENGINE AIRPLANES IN COMMERCIAL CARGO SERVICE
Frederick M. Healy Washington May 1972 27 p refs
(NASA-TN-D-6790; L-8262) Avail: NTIS HC $3.00 CSCL 01B

Data are presented for derived gust velocities and for incremental normal accelerations due to gusts, maneuvers, and landing impacts. The data were obtained from NASA VGH recorders installed on three four-engine cargo airplanes operated by three airlines. Continental United States and trans-Pacific routes were covered. Author

N72-24016*# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.
FLIGHT CALIBRATION OF COMPENSATED AND UNCOMPENSATED PITOT-STATIC AIRSPEED PROBES AND APPLICATION OF THE PROBES TO SUPERSONIC CRUISE VEHICLES
Lannie D. Webb and Harold P. Washington Washington May 1972 43 p refs
(NASA-TN-D-6827; H-665) Avail: NTIS HC $3.00 CSCL 01D

Static pressure position error calibrations for a compensated and an uncompensated XB-70 nose boom pitot static probe

were obtained in flight. The methods (Pacer, acceleration-deceleration, and total temperature) used to obtain the position errors over a Mach number range from 0.5 to 3.0 and an altitude range from 25,000 feet to 70,000 feet are discussed. The error calibrations are compared with the position error determined from wind tunnel tests, theoretical analysis, and a standard NACA pitot static probe. Factors which influence position errors, such as angle of attack, Reynolds number, probe tip geometry, static orifice location, and probe shape, are discussed. Also included are examples showing how the uncertainties caused by position errors can affect the inlet controls and vertical altitude separation of a supersonic transport. Author

N72-24017# National Transportation Safety Board, Washington, D.C.
BRIEFS OF AIRCRAFT ACCIDENTS INVOLVING CORPORATE /EXECUTIVE AIRCRAFT: US GENERAL AVIATION, 1970
Jun. 1972 42 p
(NTSB-AMM-72-5) Avail: NTIS HC $4.25

Aircraft accidents involving corporate executive type aircraft in U.S. general aviation during calendar year 1970 are reported. The reports contain satistical, cause/factor and injury tables, accident rates, and pilot qualification data. Author

N72-24018# National Transportation Safety Board, Washington, D.C.
BRIEFS OF AIRCRAFT ACCIDENTS INVOLVING AIR TAXI OPERATIONS: US GENERAL AVIATION, 1970
Jun. 1972 93 p
(NTSB-AMM-72-4) Avail: NTIS HC $6.75

Aircraft accidents involving air taxi operations in U.S. general aviation for calendar year 1970 are reported. The reports contain statistical, cause/factor and injury tables, accident rates, and pilot qualification data. Author

N72-24019# National Transportation Safety Board, Washington, D.C.
BRIEFS OF AIRCRAFT ACCIDENTS INVOLVING ROTORCRAFT: US GENERAL AVIATION, 1970
Jun. 1972 123 p
(NTSB-AMM-72-3) Avail: NTIS HC $8.25

Aircraft accidents involving rotorcraft in U.S. general aviation for calendar year 1970 are reported. The reports are based on statistical cause/factor and injury aspects, accident rates, and pilot qualification information. Author

N72-24020*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
TABULATED PRESSURE MEASUREMENTS ON A LARGE SUBSONIC TRANSPORT MODEL AIRPLANE WITH HIGH BYPASS RATIO, POWERED, FAN JET ENGINES
Stuart G. Flechner and James C. Patterson, Jr. Washington May 1972 345 p refs
(NASA-TM-X-2530; L-8182) Avail: NTIS HC $3.00 CSCL 01B

An experimental wind-tunnel investigation to determine the aerodynamic interference and the jet-wake interference associated with the wing, pylon, and high-bypass-ratio, powered, fan-jet model engines has been conducted on a typical high-wing logistics transport airplane configuration. Pressures were measured on the wing and pylons and on the surfaces of the engine fan cowl, turbine cowl, and plug. Combinations of wing, pylons, engines, and flow-through nacelles were tested, and the pressure coefficients are presented in tabular form. Tests were conducted at Mach numbers from 0.700 to 0.825 and angles of attack from -2 to 4 deg. Author

N72-24021# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
ON THE CONTROL OF A FOUR-VEHICLE TRAIN OF SURFACE EFFECT VEHICLES
Victor Cohen and David Rothschild Apr. 1972 94 p refs
(RM-539) Avail: NTIS HC $6.75

An investigation of a train of four surface effect vehicles moving over a flat terrain with prescribed motion of the lead vehicle was conducted. The motion is composed of arcs of constant radius of curvature that includes as a special case the straight-line motion. The objective of the investigation was to ascertain the stability and controllability of this type of configuration and to generate easily implementable schemes to control the remaining vehicles such that they return to the nominal trajectory generated by the lead vehicle. Modern control theory was the basis for generating various linear optimal control laws for the linearized system about the nominal trajectories for various allowable feedback measurements and control configured vehicles. The minimum number of controls for this four-vehicle train on a curve of finite radius is at least one of either the lateral, longitudinal or moment control on the last vehicle, implying that the second and third vehicles are trailered. This single control is a function of the relative angles and rates between all of the vehicles. Author

N72-24022# Federal Aviation Administration, Oklahoma City, Okla. Natioanl Flight Inspection Div.
EVALUATION OF EXECUTIVE JET APPROACH ANGLES Final Report
Frank Parr Apr. 1972 73 p
(FAA-FS-600-7) Avail: NTIS HC $5.75

Evaluations were flown in the Aero Jet Commander, Gates Lear Jet, North American Sabreliner, and Lockheed JetStar. Approach slope angles were varied from approximately 3 degrees up to almost 7 degrees. Flight parameters were measured in the areas of descent airspeed, power requirements in flare, flyability, sink rates, threshold crossing heights, and touchdown distances. Objective and subjective measurements were made. It was found that when approach slope angles above 4 degrees (approximate minimums of 400 feet altitude - 1 mile visibility) were used they were accompanied by problems of power requirement, flyability, high sink rates, and long touchdown distances. Author

N72-24023*# Scientific Translation Service, Santa Barbara, Calif.
DURABILITY STUDIES ON COMPONENTS OF THE VFW-H3 GYRODYNE
W. Paul Washington NASA May 1971 22 p Transl. into ENGLISH from the publ. "Betriebsfestigkeitsprobleme bie Hubschrauben" Stuttgart, DGLR, Dec. 1970 p 124-156 Presented at DGLR Symp. on Helicopters and Propellers, Immenstaad, West Germany, 24 Jun. 1969
(Contract NASw-2035)
(NASA-TT-F-14284) Avail: NTIS HC $3.25 CSCL 01B

As part of the development of the VFW H3/H5 gyrodyne family, various durability tests were performed. One of the major objectives was demonstration of satisfactory confidence that the rotor blades and their connections would not fatigue. Author

N72-24024*# Michigan Univ., Ann Arbor.
AN EVALUATION OF STRING THEORY FOR THE PREDICTION OF DYNAMIC TIRE PROPERTIES USING SCALE MODEL AIRCRAFT TIRES
S. K. Clark, R. N. Dodge, and G. H. Nybakken Washington NASA Jun. 1972 54 p refs
(Grant NGL-23-005-010)
(NASA-CR-2058; Rept-056080-18-T) Avail: NTIS HC $3.00 CSCL 01B

The string theory was evaluated for predicting lateral tire dynamic properties as obtained from scaled model tests. The experimental data and string theory predictions are in generally good agreement using lateral stiffness and relaxation length values obtained from the static or slowly rolling tire. The results indicate that lateral forces and self-aligning torques are linearly proportional to tire lateral stiffness and to the amplitude of either

steer or lateral displacement. In addition, the results show that the ratio of input excitation frequency to road speed is the proper independent variable by which frequency should be measured. Author

N72-24025*# Boeing Co., Philadelphia, Pa. Vertol Div.
ACCEPTABILITY OF VTOL AIRCRAFT NOISE DETERMINED BY ABSOLUTE SUBJECTIVE TESTING
Harry Sternfeld, Jr., Ernest G. Hinterkeuser, Roy B. Hackman, and Jerry Davis Washington NASA Jun. 1972 90 p refs (Contract NAS1-10044)
(NASA-CR-2043; D-210-10392-1) Avail: NTIS HC $3.00 CSCL 01C

A program was conducted during which test subjects evaluated the simulated sounds of a helicopter, a tilt wing aircraft, and a 15 second, 90 PNdB (indoors) turbojet aircraft used as reference. Over 20,000 evaluations were made while the test subjects were engaged in work and leisure activities. The effects of level, exposure time, distance and aircraft design on subjective acceptability were evaluated. Some of the important conclusions are: (1) To be judged equal in annoyance to the reference jet sound, the helicopter and tilt wing sounds must be 4 to 5 PNdB lower when lasting 15 seconds in duration. (2) To be judged significantly more acceptable than the reference jet sound, the helicopter sound must be 10 PNdB lower when lasting 15 seconds in duration. (3) To be judged significantly more acceptable than the reference jet sound, the tilt wing sound must be 12 PNdB lower when lasting 15 seconds in duration. (4) The relative effect of changing the duration of a sound upon its subjectively rated annoyance diminishes with increasing duration. It varies from 2 PNdB per doubling of duration for intervals of 15 to 30 seconds, to 0.75 PNdB per doubling of duration for intervals of 120 to 240 seconds. Author

N72-24026# Royal Aircraft Establishment, Farnborough (England).
A FLIGHT INVESTIGATION OF A STOL AIRCRAFT
Jiro Koo, Tolchi Oka, Yukichi Tsukana, Yukio Kamata, and Takatsuga Ono Oct. 1971 26 p refs Transl. into ENGLISH from Japan Natl. Aerospace Lab. report TM-146, Aug. 1968
(RAE-Lib-Trans-1604; BR28945; TM-146) Avail: NTIS HC $3.50

The take-off and landing characteristics of a STOL were investigated to point out the factors limiting the STOL operation. To evaluate the STOL performance, the operational envelope and the time history of STOL take-off and landing were demonstrated. Author

N72-24027# Weapons Research Establishment, Salisbury (Australia).
STATIC AERODYNAMIC CHARACTERISTICS OF A WRAP-AROUND FIN CONFIGURATION WITH SMALL ROLLING MOMENTS AT LOW INCIDENCE
M. L. Robinson and C. E. Fenton Nov. 1971 72 p ref
(WRE-TN-527(WR/D)) Avail: NTIS HC $5.75

The static aerodynamic forces and moments (excluding axial force) have been measured on a wrap-around fin configuration in the Mach number range 0.5 to 2.4. The tail assembly of the wrap-around fin configuration consists of eight curved fin panels arranged in pairs having mirror symmetry about two orthogonal axes. The rolling moments generated are very small throughout the Mach number range at incidence angles less than 5 deg. The static longitudinal stability is considered satisfactory. It appears that the longitudinal stability could be improved by slight changes in the fin layout, without degrading the rolling moment performance. Author

N72-24028# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Flugmechanik der Luftafahrzeuge.
ON THE INFLUENCE OF LIFT ENGINE ARRANGEMENT ON THE EIGENMOTION OF LIFT JET POWERED VTOL AIRCRAFT IN HOVERING FLIGHT [UEBER DEN EINFLUSS DER HUBTRIEBWERKSANORDNUNG AUF DIE EIGENBEWEGUNG STRAHLGESTUETZTER VTOL-FLUGZEUGE IM SCHWEBEFLUG]
Dietrich Hanke 1971 51 p refs In GERMAN; ENGLISH summary
(DLR-FB-71-112) Avail: NTIS HC $4.75; DFVLR, Porz 12,50 DM

The influence of lift engine arrangement on the stability of lift jet powered VTOL-aircraft in hovering flight is investigated. To that end, the forces and moments occurring at the inlet in consequence of the air masses sucked in by the engines are computed by means of the momentum theory. Furthermore, the engine derivatives are derived and equations of motion for hovering flight are defined. For eight VTOL configurations with different lift engine arrangement, the eigenvalues of the coupled longitudinal and lateral motion are computed. The vertical distance of engine inlets from the center of gravity of the aircraft proves to be the essential stability parameter. Author (ESRO)

N72-24029# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
MODEL ANALYSIS OF VEHICLE TRAFFICABILITY WITH APPLICATION TO SURFACE EFFECT VEHICLES ON SEA ICE FIELDS
Martin Smith and Yoshisuke Nakano Jan. 1972 22 p refs (ARPA Order 1615)
(AD-737601; CRREL-RR-298) Avail: NTIS CSCL 01/3

Efforts were made to derive the design criteria of surface effect vehicles operated on arctic sea ice. Statistical theories were developed to describe trafficability of the vehicles and topography of the sea ice. By the use of actual sea ice surface profiles obtained by an aerial laser profiler, the usefulness of the present statistical method was demonstrated. Author (GRA)

N72-24030# Army Air Mobility Research and Development Lab., Fort Eustis, Va.
DYNAMIC RESPONSE OF THE OV-1A AIRCRAFT TO SOFT FIELD LANDINGS Final Report, Jul. - Aug. 1967
William T. Alexander Oct. 1971 140 p refs
(DA Proj. 1F1-62204-A-146)
(AD-737752; USAAMRDL-TR-71-62) Avail: NTIS CSCL 01/3

The report presents the ground loads measured on an instrumented OV-1 airplane during landings on smooth and rough fields. Test results for three landings are compared with the results of dynamic loads computations performed on a digital computer. The computing program is also used to calculate the loads which would have been obtained by landings and rollouts on the roughest portions of two fields whose contours were measured. Failing loads were obtained on one field only. The equations of motion for the computer program are presented. Recommendations are made for future investigations that will improve the analytical procedures. Author (GRA)

N72-24031# European Research Office, London (England).
THE FAS.2 HELICOPTER STABILIZER, FERRANTI INTERNATIONAL NEWS, AUTUMN 1971
Richard L. Scharpf 1971 4 p ref
(AD-737707; ERO-2-1972) Avail: NTIS CSCL 01/3

The report is based on an article published in the autumn issue, 1971, of 'Ferranti International News.' The article describes Ferranti autostabilizer developed for helicopters. It is an add-on system of electromechanical design which provides short term attitude holding to relieve the pilot of having to continuously stabilize the helicopter. GRA

N72-24032# Technology, Inc., Dayton, Ohio.
FLIGHT LOADS INVESTIGATION OF OH-6A HELICOPTERS OPERATING IN SOUTHEAST ASIA
F. Joseph Giessler, Larry E. Clay, and John F. Nash Oct. 1971 242 p refs

(Contract DAAJ02-70-C-0026; DA Proj. 1F1-62204-A-146)
(AD-738202; USAAMRDL-TR-71-60) Avail: NTIS CSCL 01/3

From structural flight loads measurements on three OH-6A helicopters, 216 hours of usable multichannel flight data were recorded as the helicopters operated from bases in Southeast Asia. Data were processed and analyzed according to four flight phases, called mission segments: ascent, maneuver, descent, and steady state. Data are presented in the form of time and occurrence tables, histograms, and exceedance curves.
Author (GRA)

N72-24033# Boeing Co., Philadelphia, Pa. Vertol Div.
ADVANCED GEOMETRY, GLASS-FIBER REINFORCED PLASTIC ROTOR BLADE TEST PROGRAM Final Technical Report, Jun. 1967 - Feb. 1971
Donald J. Hoffstedt Sep. 1971 456 p refs
(Contract DAAJ02-67-C-0072; DA Proj. 1F1-63204-D-157)
(AD-738203; D210-10079-1; USAAMRDL-TR-71-42) Avail: NTIS CSCL 01/3

The report presents the results of a program to design, tool, fabricate, bench test, and flight test glass-reinforced epoxy rotor blades. Blade design used S-glass reinforced epoxy, a mechanically trapped and bonded titanium root end attachment, and aerodynamic contours employing advanced airfoils, thickness taper, and planform taper. Fiberglass tooling was successfully employed, and fabrication and quality assurance techniques were developed for the prototype quantity of 12 rotor blades. Static and fatigue tests were conducted for both rotor blade elements and full-scale structure, and whirl test demonstration was completed. Exploratory flight testing was performed on a CH-47C prototype instrumented aircraft used as a test-bed.
GRA

N72-24034# Federal Aviation Administration, Washington, D.C.
AVIATION FORECASTS: FISCAL YEARS 1972 - 1983
Sep. 1971 51 p
(AD-738360) Avail: NTIS CSCL 01/2

Contents: Highlights of Fiscal Year 1971; Aviation industry Forecasts (Air carrier traffic, Air carrier fleet, General aviation flying and aircraft fleet, Domestic aviation fuel consumption, Civil aircraft and engine production); FAA air traffic activity forecasts (Aircraft operations at airports with FAA traffic control service, FAA en route traffic control activity, FAA flight services); Airmen forecasts (Number of active pilots).
GRA

N72-24035# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.
FLIGHT CALIBRATION TESTS OF F-8 AIRCRAFT FOR OPTIMAL ENERGY CLIMBS Final Technical Report, 1 Mar. - 30 Oct. 1971
D. C. Sederstrom Feb. 1972 93 p refs
(Contract N00014-71-C-0274; NR Proj. 213-081)
(AD-738018; Rept-12653-F(R)) Avail: NTIS CSCL 01/2

An F8 energy management flight test based on use of the energy state approximation and on test aircraft data for computation of minimum time energy climbs is described. Three types of climbs were made: Handbook climbs with level accelerations, an optimum climb path computed from published data and an optimal climb path determined from data obtained in the flight tests. Comparisons of these climbs are presented. Effects of ambient temperature, a major factor in the practical use of energy management, are discussed.
Author (GRA)

N72-24036# North American Rockwell Corp., Columbus, Ohio.
STUDY OF CONTROL DEVICES FOR IMPROVED TACTICAL AGILITY Final Report
R. H. Hanna and Vearl R. Stewart Aug. 1971 96 p refs
(Contract N00014-71-C-0062; NR Proj. 212-202)
(AD-737694; NR71H-317) Avail: NTIS CSCL 01/3

A study was conducted to determine the effect of the control device characteristics on airplane agility at transonic speeds. A list of over 600 reports containing data on various control devices is presented. A discussion of the more widely used control devices is presented together with data showing trends and general characteristics. From this list of control devices certain devices were selected for evaluation on a baseline configuration. An Agility Index was formulated for the evaluation of the selected control devices. The results of this portion of the study showed certain control devices than enhanced agility. A fighter aircraft was configured with the agility enhancement control devices, evaluated for agility and compared to the baseline airplane.
Author (GRA)

03 AUXILIARY SYSTEMS

Includes fuel cells, energy conversion cells, and solar cells; auxiliary gas turbines, hydraulic, pneumatic and electrical systems; actuators, and inverters. For related information see also: 09 Electronic Equipment; 22 Nuclear Engineering; and 28 Propulsion Systems.

N72-24037* Globe-Union, Inc., Milwaukee, Wis.
METHOD OF COATING SOLAR CELL WITH BOROSILICATE GLASS AND RESULTANT PRODUCT Patent
Peter Albert Iles, inventor (to NASA) Issued 4 Apr. 1972 7 p
Filed 30 Apr. 1969 Sponsored by NASA
(NASA-Case-GSC-11514-1; US-Patent-3,653,970;
US-Patent-Appl-SN-820453; US-Patent-Class-136-89;
US-Patent-Class-117-201) Avail: US Patent Office CSCL 10A

A process for producing a glass coating for solar cells is discussed. The coating is formed from silicate glass and provides an integral and lightweight covering with high thermal emissivity. The coating is formed directly on the surface of the solar cell. No adhesives are required and one or more layers of coating may be used to provide a thin flexible cover.
P.N.F.

N72-24038*# Naval Ammunition Depot, Crane, Ind. Quality Evaluation and Engineering Lab.
EVALUATION PROGRAM FOR SECONDARY SPACECRAFT CELLS Eighth Annual Report of Cycle Life Test
D. E. Christy 9 Feb. 1972 302 p refs
(NASA Order W-12397)
(NASA-CR-126531; AR-8; QEEL/C-72-1) Avail: NTIS HC $17.25 CSCL 10A

The life cycle test of secondary spacecraft electric cells is discussed. The purpose of the tests is to insure that all cells put into the life cycle test meet the required specifications. The evaluation program gathers statistical information concerning cell performance characteristics and limitations. Weaknesses in cell design which are discovered during the tests are reported to research facilities in order to increase the service life of the cells.
Author

N72-24039*# Naval Ammunition Depot, Crane, Ind. Quality Evaluation and Engineering Lab. Dept.
EVALUATION PROGRAM FOR SECONDARY SPACECRAFT CELLS; ACCEPTANCE TESTS OF GENERAL ELECTRIC 4.5 AMPERE-HOUR NICKEL-CADMIUM CELLS, NIMBUS TYPE
D. E. Christy 29 Mar. 1972 11 p
(NASA Order S-23404-G)
(NASA-CR-126659; QEEL/C-72-128) Avail: NTIS HC $3.00 CSCL 10A

Results are presented of acceptance tests conducted on eleven nickel cadmium batteries of the Nimbus satellite type.
Author

N72-24040*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CIRCUIT PERFORMANCE OF A PARASITIC-LOADING DIGITAL SPEED CONTROLLER FOR A 400-HERTZ TURBINE-DRIVEN ALTERNATOR

John P. Ryan (Purdue Univ.) and Bill D. Ingle Mar. 1972 26 p refs
(NASA-TM-X-68034) Avail: NTIS HC $3.50 CSCL 10A

Parasitic speed controllers are used in space power electrical generating systems to maintain the speed of the turbine-driven alternators within specified limits. Selected subcircuits for a solid state parasitic-loading speed controller were assembled and tested. The test results as obtained to date consist of the performance evaluation of the frequency reference and the period counter subcircuits. These circuits performed as expected. Author

N72-24041*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
STRESS ANALYSIS AND DESIGN OF SILICON SOLAR CELL ARRAYS AND RELATED MATERIAL PROPERTIES
A. M. Salama, W. M. Rowe, and R. K. Yasui 1 Mar. 1972 35 p refs
(Contract NAS7-100)
(NASA-CR-126648; JPL-TR-32-1552) Avail: NTIS HC $3.75 CSCL 10A

A systematic approach is presented for the design of solar cell arrays to eliminate mechanical failures that might arise in components of the arrays in a thermal environment. A prerequisite to the approach is the characterization of material properties at different temperatures. Significant data is obtained for the thermal behavior of the silicon solar cell material and adhesives. Upon determining the mechanical and thermal material properties of the components of the solar cell array, utilizing a finite element idealization for predicting the stress fields in the components, and employing the von Mises failure criterion, potential failure areas in various design configurations in a given thermal environment are identified. Guide lines and means to optimize a given design are illustrated by two examples. Author

N72-24042*# Heliotek, Sylmar, Calif.
DEVELOPMENT AND PILOT LINE PRODUCTION OF LITHIUM DOPED SILICON SOLAR CELLS Quarterly Report
P. A. Payne Mar. 1972 36 p refs Prepared for JPL
(Contracts NAS7-100; JPL-953171)
(NASA-CR-126665; QR-2) Avail: NTIS HC $4.00 CSCL 10A

Scaling up the BCl3 without O2 diffusion beyond 30 to 40 cells was investigated by using a 100 cell capacity diffusion boat which held the cells vertically. Sheet resistances and I-V curves were uniform with 10 to 20 cells spaced along the entire boat, so the quantity was increased to 40 and then 60 cells per diffusion. There was no change in cell output and uniformity going from 20 to 40 cells per diffusion; however only half the lithium cells fabricated from slices diffused in the 60 cell diffusion had efficiencies of 11% or better. Although uniform sheet resistances and I-V characteristic curves were obtained with up to 60 cells in the BCl3 with O2 diffusion, the short circuit currents were approximately 15% lower than the anticipated 135 to 140 mA. Consequently, work on this diffusion process has been aimed solely at increasing the short circuit current. The diffusion temperature was lowered from 1055 to 1000 and 950 C, and at each of these temperatures variations in diffusion time were investigated. At 1000 C short circuit currents were approximately 10 mA higher, 130 rather than 120 mA average. Author

N72-24043*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SIMPLIFIED FABRICATION OF BACK SURFACE ELECTRIC FIELD SILICON CELLS AND NOVEL CHARACTERISTICS OF SUCH CELLS
Joseph Mandelkorn and John H. Lamneck, Jr. 1972 8 p refs Presented at 9th Photovoltaic Specialists Conf., Silver Spring, Md., 2-4 May 1972; sponsored by IEEE
(NASA-TM-X-68060; E-6923) Avail: NTIS HC $3.00 CSCL 10A

An investigation of the characteristics and behavior of 10 ohm-cm silicon cells having abnormally high open-circuit voltages was made. The cells studied were made by a new, highly simplified, contact fabrication process which creates both a contact and a thin electric field region at the cell back surface without the need for phosphorus layer removal. These cells had open-circuit voltages of about 0.58 V and their performance as a function of thickness, temperature, and 1 MeV electron irradiation is detailed. The study showed that 10 ohm-cm back-surface-field cells can have the high initial efficiencies and desirable temperature behavior of low resistivity cells. Thin back-surface-field cells were made and showed, in addition, much greater radiation damage resistance. A mechanism is proposed to explain the results. Author

N72-24044*# Illinois Univ., Urbana. Coordinated Science Lab.
A STUDY OF IRRADIATION-INDUCED DEFECTS IN SILICON USING LOW TEMPERATURE PHOTOLUMINESCENCE Final Report, 20 Sep. 1969 - 29 Jan. 1971
B. G. Streetman May 1971 93 p refs Sponsored by NASA
(Contract JPL-952383)
(NASA-CR-126625) Avail: NTIS HC $6.75 CSCL 10A

Irradiation-induced defects in silicon, using low temperature photoluminescence as a probe of defect properties were investigated. The goal of this research was to gain new understanding of defects which degrade solar cell characteristics in a radiation environment. In this regard, an important aspect of this program was a study of radiation damage and annealing in lithium doped silicon, which is useful in reducing solar cell degradation. Luminescence was used to study defects because this property reveals electron transitions through a number of defect energy levels at any given annealing stage; the luminescence spectra give excellent resolution of many defect energy levels, and these measurements can be used to give defect symmetry in the lattice, impurity dependence, and annealing properties. Author

N72-24045*# Tyco Labs., Inc., Waltham, Mass.
NiCd BATTERY ELECTRODES, C-150 Quarterly Report
G. Holleck, M. Turchan, and J. Hopkins Jan. 1972 75 p refs Prepared for JPL
(Contracts NAS7-100; JPL-953185)
(NASA-CR-126624; QR-2) Avail: NTIS HC $5.75 CSCL 10A

Electrodes for a nongassing negative limited nickel-cadmium cell are discussed. The key element is the development of cadmium electrodes with high hydrogen overvoltage. For this, the following electrode structures were manufactured and their physical and electrochemical characteristics were evaluated: (1) silver-sinter-based Cd electrodes, (2) Teflon-bonded Cd electrodes, (3) electrodeposited Cd sponge, and (4) Cd-sinter structures. Author

N72-24046*# Gould, Inc., Mendota Heights, Minn. Energy Technology.
NONGASSING NICKEL-CADMIUM BATTERY ELECTRODES AND CELLS Quarterly Report, 15 Sep. - 15 Dec. 1971
E. Luksha and D. J. Gordy 18 Feb. 1972 44 p Prepared for JPL
(Contracts NAS7-100; JPL-953184)
(NASA-CR-126623; Rept-712-122-2; QR-2) Avail: NTIS HC $4.25 CSCL 10C

The failure of nickel-cadmium storage batteries due to severe gassing during charging is discussed. In order to increase the life of such cells, nongassing positive and negative electrodes are used. The gassing characteristics of nickel electrodes were evaluated as a function of their loading, charge rate, and charge temperature. Author

N72-24047*# Ion Physics Corp., Burlington, Mass.
DEVELOPMENT OF GaAs SOLAR CELLS Quarterly Technical Report, 20 Sep. 1971 - 31 Jan. 1972
Phillip J. McNally Mar. 1972 38 p refs Prepared for JPL
(Contracts NAS7-100; JPL-953270)

(NASA-CR-126674; QTR-1) Avail: NTIS HC $4.00 CSCL 10A

Calculations of GaAs solar cell output parameters were refined and a computer model was developed for parameter optimization. The results were analyzed to determine the material characteristics required for a high efficiency solar cell. Calculated efficiencies for a P/N cell polarity are higher than an N/P cell. Both cell polarities show efficiency to have a larger dependence on short circuit current than an open circuit voltage under nearly all conditions considered. The tolerances and requirements of a cell fabrication process are more critical for an N/P type than for a P/N type cell. Several solar cell fabrication considerations relative to junction formation using ion implantation are also discussed. Author

N72-24048*# Naval Ammunition Depot, Crane, Ind. Quality Evaluation and Engineering Lab. Dept.

EVALUATION PROGRAM FOR SECONDARY SPACECRAFT CELLS: EVALUATION OF STORAGE METHODS, OPEN CIRCUIT VERSUS CONTINUOUS TRICKLE CHARGE, SONOTONE 3.5 AMPERE-HOUR SEALED NICKEL-CADMIUM SECONDARY SPACECRAFT CELLS

R. E. Thomas 3 Feb. 1972 44 p refs

(Contract NASA Order W-12397)

(NASA-CR-126671; QEEL/C-72-31) Avail: NTIS HC $4.25 CSCL 10C

Twenty-five cells were used in a five-year test to compare, after each successive one-year storage period, the discharge and charge characteristics of charged cells on open circuit versus that of cells on continuous trickle charge. The test procedure, instrumentation, and results are described. Based on the test results, the following recommendations were made: (1) If the user's purpose will allow a rejuvenation cycle or two after a long storage period, the open circuit regime will likely give slightly greater capacity. (2) If the user's purpose demands immediately available power following a long storage period, the trickle charge method of storage is definitely the regime to use. D.L.G.

N72-24049*# Melpar, Inc., Alexandria, Va.

INVESTIGATION OF SOLID STATE ELECTROLYTE SILVER-ZINC BATTERY Final Report

1 Mar. 1970 52 p

(Contract NAS5-21033)

(NASA-CR-122405) Avail: NTIS HC $4.75 CSCL 10C

Study of the solid electrolyte ZnCl2-2NH3 rechargeable silver zinc electrochemical cell by X-ray diffraction analysis of the reaction products led to the conclusion that some water is consumed when the cell is discharged. Replacement of ZnCl2-2NH3 by ZnCl2-4Zn(OH)2 gave cells with high internal resistance and limited capacity. The salt formed by exposing a fibrous membrane saturated with ZnCl2 solution to fumes from ammonium carbonate in a dry desiccator comprised ZnCl2-4Zn (OH)2, ZnCl2,3NH4Cl and a third unidentified component. The temperature coefficient of open circuit EMF was nearly zero over the range from -25 C to 50 C. The internal resistance and polarization increased substantially below -25 C. There is some indication that exposure to 50 C for 29 hours causes some deterioration. Author

N72-24050*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

PARALLEL OPERATION OF TWO BRAYTON-CYCLE ALTERNATORS WITH PARASITIC SPEED CONTROLLERS

Dennis A. Perz [1972] 16 p refs Proposed for presentation at the 7th Intersociety Energy Conversion Eng. Conf., San Diego, Calif., 25-29 Sep. 1972

(NASA-TM-X-68068) Avail: NTIS HC $3.00 CSCL 10A

The experimental paralleling characteristics of two 1200 Hz Brayton-cycle alternators are presented. Since the Brayton power conversion system uses electric speed controllers, the paralleling requirements are somewhat different from those for conventional ground-based systems. Results include the transient effects of synchronizing the two alternators with various phase-angle, voltage, and frequency differences. Based on these results, the effects of synchronizing differences can be defined, and adjustment requirements of the parasitic speed controllers during synchronizing can be established. Data indicate that parasitically loaded alternators are able to parallel over a wide range of synchronizing differences. However, equilibrium could not be reached in extreme cases where alternator load differences were great and, at the same time, the phase-angle error was large (150 deg or more). Author

N72-24051*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NONLEAKING BATTERY TERMINALS

William E. Snider and William J. Nagle [1972] 10 p refs Proposed for presentation at 7th Intersoc. Energy Conversion Eng. Conf., San Diego, Calif., 25-29 Sep. 1972

(NASA-TM-X-68067) Avail: NTIS HC $3.00 CSCL 10C

Three different terminals were designed for usage in a 40 ampere/hour silver zinc battery which has a 45 percent KOH by weight electrolyte in a plastic battery case. Life tests, including thermal cycling, electrical charge and discharge for up to three years duration, were conducted on these three different terminal designs. Tests for creep rate and tensile strength were conducted on the polyphenylene oxide (PPO) plastic battery cases. Some cases were unused and others containing KOH electrolyte were placed on life tests. The design and testing of nonleaking battery terminals for use with a potassium hydroxide (KOH) electrolyte in a plastic case are discussed. Author

N72-24052*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ROTOR WINDAGE LOSSES FOR LUNDELL ALTERNATORS

Sol H. Gorland and Erwin E. Kempke, Jr. [1972] 10 p refs Proposed for presentation at 7th Intersoc. Energy Conversion Eng. Conf., San Diego, Calif., 25-29 Sep. 1972

(NASA-TM-X-68079) Avail: NTIS HC $3.00 CSCL 10A

The Lundell alternator is being investigated for power system applications. At the high speeds required, power loss due to windage can become high and result in significant heating of the alternator. This loss must be incorporated in the cooling design. The velocity profiles expected in these alternators are highly turbulent, and the Reynolds numbers are well above the levels previously reported; the available data could only be extrapolated. For this reason, a range of experimental data was generated to permit accurate calculation of the windage power loss for Lundell alternator design. Windage tests were conducted on two concentric rotor-stator configurations in ambient air, producing Reynolds numbers as high as 100,000. Using the data obtained, a method was developed to calculate the windage loss for any Lundell alternator given the geometry and cavity conditions. Author

N72-24053*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ASDTIC DUTY-CYCLE CONTROL FOR POWER CONVERTERS

V. R. Lalli and A. D. Schoenfeld (TRW Inc., Redondo Beach, Calif.) [1972] 11 p refs Presented at 3d Ann. Power Process. and Electron. Specialists Conf., Atlantic City, 22-23 May 1972; Sponsored by Inst. of Elec. and Electron. Engr.

(Contract NAS12-2017)

(NASA-TM-X-68066; E-6940) Avail: NTIS HC $3.00 CSCL 10A

The application of analog signal to discrete interval converter (ASDTIC), a hybrid micromodule, two loop control subsystem, to a switching, stepdown dc to dc converter is described. The power circuitry, interface and ASDTIC subsystems used in this switching regulator were developed to exhibit the improved regulation, transient performance, regulator stability and freedom from the effects of variations in parts characteristics due to environmental changes and aging. ASDTIC can be used with other types of power circuits that use duty-cycle control techniques by simple changes in the interface subsystem. The circuitry and performance characteristics of a +10V dc switching

converter as well as that of the ASDTIC micromodule are described. Realization of the ASDTIC hybrid micromodule has been accomplished with a hermetically sealed, beam-lead, bonded/deposited nichrome thin film resistors, discrete capacitors and integrated circuits on dilithic, glazed alumina substrates using 22 feed through terminals in an integrated package.
Author

N72-24054# Electrical Research Association, Leatherhead (England).
DEVELOPMENT OF INTEGRAL COVERS FOR SILICON SOLAR CELLS Interim Report, No. 3
G. Brackley, K. Lawson, and D. W. Satchell Paris ESRO Jul. 1971 36 p refs
(Contract ESTEC-810/69)
(ESRO-CR-44-IR-3; IR-3) Avail: NTIS HC $4.00

The radio frequency sputtering of silica glass coatings as integral covers of silicon solar cells was investigated, and special attention was paid to the optical properties of the coating. Further investigations were carried out on the efficiency and deposition rate of the sputtering apparatus, and of silica. It is shown that DC7070 glass covers are superior to DC7740 and Schott 8330. The properties of sputtered films are examined in more detail. Adhesion and edge coverage are shown to be good. Particular attention is given to discoloration during deposition, and it is concluded that this results from electron bombardment. The use of ceria (CeO2) to resist radiation darkening in space is proposed. Author (ESRO)

N72-24055# Battelle Memorial Inst., Columbus, Ohio.
THE THERMAL CONDUCTIVITY OF SEALED NICKEL-CADMIUM CELLS
Eric W. Brooman and John McCallum Wright-Patterson AFB, Ohio AFAPL Feb. 1972 84 p refs
(Contract F33615-69-C-1537; AF Proj. 3145)
(AD-737519; AFAPL-TR-71-75) Avail: NTIS CSCL 10/3

The objective of the research task is to show that thermal resistances or conductivities of cells or batteries can be predicted on the basis of knowing the sizes, arrangements, and the composition of the cell or battery components, and their thermal conductivities. The thermal anisotropy of 20-ampere-hour nickel-cadmium aerospace cells, as given by the ratio of conductivities in the parallel and perpendicular directions, varies according to cell type, and values in the range 1.76 through 2.63 were obtained. Author (GRA)

04 BIOSCIENCES

Includes aerospace medicine, exobiology, radiation effects on biological systems; physiological and psychological factors. For related information see also: 05 Biotechnology.

N72-24056*# Southwest Research Inst., San Antonio, Tex.
AEROSPACE TECHNOLOGY AND HOSPITAL SYSTEMS
[1972] 90 p refs Sponsored by NASA
(NASA-CR-126664) Avail: NTIS HC $6.50 CSCL 06E

The use of aerospace medical techniques to improve the quality of earth health care systems is discussed. Data are focused on physiological measurements and monitoring, medical information management, clean room technology, and reliability and quality assurance for hospital equipment. E.H.W.

N72-24057*# Little (Arthur D.), Inc., Cambridge, Mass.
BIOLOGICAL CYCLING OF ATMOSPHERIC TRACE GASES Final Report
Dian R. Hitchcock and Alfred E. Wechsler Mar. 1972 419 p refs
(Contract NASw-2128)
(NASA-CR-126663) Avail: NTIS HC $23.00 CSCL 06A

A detailed critical review was conducted of present knowledge of the influence of biological processes on the cycling of selected atmospheric gas constituents--methane, carbon monoxide, and gaseous compounds of nitrogen (nitrous oxide, ammonia, nitric oxide, and nitrogen dioxide) and sulfur (hydrogen sulfide and sulfur dioxide). The identification was included of biological and other sources of each gas, a survey of abundance measurements reported in the literature, and a review of the atmospheric fate of each contituent. Information is provided on which to base conclusions regarding the importance of biological processes on the atmospheric distribution and surface-atmosphere exchange of each constituent, and a basis for estimating the adequacy of present knowledge of these factors. A preliminary analysis was conducted of the feasibility of monitoring the biologically influenced temporal and spatial variations in abundance of these gases in the atmosphere from satellites. Author

N72-24058# Advisory Group for Aerospace Research and Development, Paris (France).
AEROMEDICAL HANDBOOK FOR AIRCREW
T. G. Dobie Mar. 1972 226 p
(AGARD-AG-154) Avail: NTIS HC $13.50

An aeromedical handbook, designed to provide information on the various aspects of aviation medicine that affect aircrew tasks, is presented. Data cover mental and physical health, effects of noise, survival measures, high altitude breathing, preventive medicine, and various other protective measures necessary for a safe flight. E.H.W.

N72-24059*# Baylor Univ., Houston, Tex. Coll. of Medicine.
OPERATIONAL TESTING OF SYSTEM FOR AUTOMATIC SLEEP ANALYSIS Final Report
Peter Kellaway 13 Apr. 1972 12 p ref
(Contract NAS9-11127)
(NASA-CR-115576) Avail: NTIS HC $3.00 CSCL 06P

Tables on the performance, under operational conditions, of an automatic sleep monitoring system are presented. Data are recorded from patients who were undergoing heart and great vessel surgery. This study resulted in cap, electrode, and preamplifier improvements. Children were used to test the sleep analyzer and medical console write out units. From these data, an automatic voltage control circuit for the analyzer was developed. A special circuitry for obviating the possibility of incorrect sleep staging due to the presence of a movement artifact was also developed as a result of the study. Author

N72-24060# National Defence Research Organization TNO, Soesterberg (Netherlands). Inst. for Perception.
SIGNAL DETECTION, CRITERION VARIABILITY AND THE NUMBER OF RESPONSE CATEGORIES
W. H. Janssen 1972 16 p refs
(IZF-1972-5; TDCK-59570) Avail: NTIS HC $3.00

An attempt was made to evaluate the effects of criterion variance on estimates of sensitivity parameters made from rating data. A movement detection task was employed to this purpose. The results show that the slope of the ROC-curve depends on the magnitude of criterion variability. This means that estimates of signal detection theory parameters are not independent of the psychophysical procedure employed. Author

N72-24061# National Defence Research Organization TNO, Soesterberg (Netherlands).
LITERATURE REVIEW OF HUMAN OCULAR ABSORPTION IN THE VISIBLE
Dirk vanNorren 1972 15 p refs
(IZF-1972-8; TDCK-59635) Avail: NTIS HC $3.00

All major studies on human ocular absorption (the macula not included) are gathered. From every paper important data like wavelength interval, age, and a figure of the ocular absorption curve are copied. After a discussion on the age effect a curve is proposed which represents the absorption of the average 30 year old observer. Author

N72-24062# National Defence Research Organization TNO, Soesterberg (Netherlands). Inst. for Perception.
A TEST OF LUCE'S TWO-STATE THEORY OF PSYCHOPHYSICAL DETECTION
W. H. Janssen 1971 17 p refs
(IZF-1971-16; TDCK-58339) Avail: NTIS HC $3.00

An experiment is discussed in which a prediction was tested from Luce's two-state theory in its most extended form. This prediction specifies upper and lower bounds upon the ratio of a posteriori probabilities in detection tasks in which the observer is allowed to give responses on a rating scale. In this experiment the signal was a 1000 cps pure sinusoid presented on a continuous background of white Gaussian noise. The results contradicted theoretical predictions; 11 out of 18 a posteriori ratio's violated the limits that were predicted. An ad hoc attempt to revise the theory was undertaken. Author

N72-24063*# Techtran Corp., Glen Burnie, Md.
RESPIRATION IN AN ATMOSPHERE UNDER HIGH PRESSURE
G. V. Troshikhin Washington NASA May 1972 10 p refs Transl. into ENGLISH from Fiziol. Zh. SSSR (USSR), v. 57, no. 12, 1971 p 1808-1812 Presented at Symp. entitled, "Function of External Respiration in an Altered Gas Medium," Leningrad, 22 Jan. 1971
(Contract NASw-2037)
(NASA-TT-F-14258) Avail: NTIS HC $3.00 CSCL 06P

The electrical activity of the external intercostal muscle and the time of the respiratory cycle were investigated in adult Wistar rats during exposure to various gas mixtures at increased pressure. Increased density of inspired gas mixture, due either to an increase in external respiration or physical characteristics of the inert gas, used for dilution of the oxygen, produces an increase in the amplitude of the electrical pulses in the respiratory volleys and the time of the respiratory cycle. A reaction of this kind in a dense medium is the consequence of an increase in the resistance to respiration and a rise in the load on the respiratory musculature. The paper also considers the mechanism of the increase in resistance to respiration in a pressurized atmosphere. Author

N72-24064*# Techtran Corp., Glen Burnie, Md.
CHANGE IN RESPIRATION WITH INCREASING HYPERCAPNIA
V. P. Zagryadskiy Washington NASA May 1972 6 p refs Transl. into ENGLISH from Fiziol. Zh. SSSR (USSR), v. 57, no. 12, 1971 p 1820-1822
(Contract NASw-2037)
(NASA-TT-F-14259) Avail: NTIS HC $3.00 CSCL 06P

An analysis is presented of the changes in the indices of external respiration in man with concentrations of carbon dioxide increasing at various rates in the inspired air. It was found that as the rate of accumulation of CO2 in the inspired air decreased, the compensatory mechanisms of external respiration were able to adapt more fully and the individual was able to better tolerate an increase of up to 6% in the concentration of carbon dioxide. Author

N72-24065*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SONIC BOOM EFFECT ON FISH: OBSERVATIONS
Max E. Wilkins May 1972 9 p refs
(NASA-TM-X-62163) Avail: NTIS HC $3.00 CSCL 06C

Motion pictures of fish in a small tank at the time a bullet traveling 1200 m/sec passes a few centimeters above indicate that fish sense the passage of the shock wave but suffer no ill effects. The pressure rise at the bow shock wave was 0.26 atm or 275 times that associated with a strong sonic boom, for example, from the proposed supersonic transport. Author

N72-24066# Joint Publications Research Service, Arlington, Va.
REPITITION RATE OF RANGING SIGNALS OF DOLPHINS AS A FUNCTION OF DISTANCE TO TARGET
V. P. Morozov, A. I. Akopian, V. I. Burdin, K. A. Zaytseva, and Yu. A. Sokovykh 17 Apr. 1972 11 p refs Transl. into ENGLISH from Biofizika (Moscow), v. 17, no. 1, 1972 p 139-144
(JPRS-55729) Avail: NTIS HC $3.00

The results are given of an experimental study on the patterns of change in the repetition rate of ranging signals of a dolphin in the process of active ranging to a target (fish). It was established that the repetition rate of ranging signals during movement of the animal toward the fish varies within a certain range, at the same time retaining high values T sub O = 2 sup L/c, where L is the distance from the dolphin to the target, c is the speed of propagation of sound in the water. The collected data make it possible to assume that the dolphin emits each successive ranging pulse only some time (averaging 20 msec) after the echo from the preceding pulse is received. Author

N72-24067# Joint Publications Research Service, Arlington, Va.
THE EFFECT OF LASER BEAMS ON THE TUNICS OF THE EYE
S. P. Berezina 13 Apr. 1972 6 p refs Transl. into ENGLISH from Biol. Nauki (Moscow), no. 11, 1971 p 46-49
(JPRS-55701) Avail: NTIS HC $3.00

Experimental data are submitted on the nature of the effect of ruby and neodymium lasers on the tunics of the eye. Information is given on transmissibility of different eye tissues. The results of these experiments are important to gain understanding of extensiveness of lesions within the eye. Author

N72-24068*# Techtran Corp., Glen Burnie, Md.
EXTRATERRESTRIAL LIFE AND ITS DETECTION METHODS
A. A. Imshenetskiy, ed. Washington NASA May 1972 262 p refs Transl. into ENGLISH of the book "Zhiznvne Zemli i Metody yeye Obnaruzheniya" Moscow, Nauka press, 1970
(Contract NASw-2037)
(NASA-TT-F-710) Avail: NTIS HC $3.00 CSCL 06C

A collection devoted to problems of space evolution, as well as the possibilities of export and import of life in space is presented. A critical evaluation is included of several of the methods which exist at the present time for detecting life outside the earth and the possibility of survival of lower organisms in experimental conditions simulating those in outer space. Author

N72-24069*# Scientific Translation Service, Santa Barbara, Calif.
EXPERIMENTAL VERIFICATION OF THE ABILITY OF QUAIL EMBRYOS TO ASSIMILATE ATMOSPHERIC NITROGEN
I. B. Zbarskiy, K. A. Perevoshchikova, G. I. Gintsburg, V. L. Kretovich, N. P. Lvov, B. I. Mazurin, Ye. N. Mishustin, L. L. Shanin, V. I. Vinogradov, V. L. Talroze et al Washington NASA May 1972 23 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Biol. (USSR), no. 4, 1971 p 538-550
(Contract NASw-2035)
(NASA-TT-F-14273) Avail: NTIS HC $3.25 CSCL 06C

In conjunction with other publications which indicate that molecular nitrogen is assimilated by animals and higher plants from the atmosphere, an experimental examination of this problem was conducted using quail eggs which were studied without incubation and (together with the young quail) after incubation in an atmosphere containing nitrogen enriched with the N-15 isotope and in ordinary air. The investigation of the quantitative content of nitrogen by the Kjeldahl semimicro method and the determination of the isotopic nitrogen content by means of a high sensitivity mass spectrometer indicates that atmospheric nitrogen is not assimilated by the developing embryo. The statistical analysis of the results indicates a slight tendency toward a decrease in total nitrogen content in the egg during incubation, which is in agreement with the liberation of a small quantity of volatile nitrogen compounds by the developing egg. Author

N72-24070*# California Univ., Berkeley. Space Sciences Lab.
CONSTITUENCY AND ORIGINS OF CYCLIC GROWTH LAYERS IN PELECYPOD SHELLS, PART 1 Final Report
William B. N. Berry Apr. 1972 267 p refs
(Grant NGR-05-003-067)
(NASA-CR-126672; SSL-Ser-13-Issue-36) Avail: NTIS HC $15.50 CSCL 06C

Growth layers occurring in shells of 98 species of pelecypods were examined microscopically in thin section and as natural and etched surfaces. Study began with shells of eleven species known from life history investigations to have annual cycles of growth. Internal microstructural features of the annual layers in these shells provided criteria for recognition of similar, apparently annual shell increments in eighty-six of eighty-seven other species. All of the specimens feature growth laminae, commonly on the order of 50 microns in thickness. The specimens from shallow marine environments show either a clustering of growth laminae related to the formation of concentric ridges or minor growth bands on the external shell surface. Based on observations of the number of growth laminae and clusters per annual-growth layer, it was hypothesised that the subannual increments may be related to daily and fortnightly (and in some cases monthly) cycles in the environment. Possible applications of the paleogrowth method in the fields of paleoecology and paleoclimatology are discussed. Author

N72-24071*# Scientific Translation Service, Santa Barbara, Calif.
STIMULATION OF EMBRYONIC RAT CELLS IN CULTURE BY A PROTEIN FRACTION ISOLATED FROM FETAL CALF SERUM. 1: ELECTROPHYSIOLOGICAL MEASUREMENTS AT THE CELL SURFACE MEMBRANES
D. F. Huelser and W. Frank Washington NASA Jun. 1972 10 p refs Transl. into ENGLISH from Z. Naturforsch. (Tubingen), Part B, v. 26b, 1971 p 1045-1048
(Contract NASw-2035)
(NASA-TT-F-14306) Avail: NTIS HC $3.00 CSCL 06C

Normal embryonic rat cells incubated in serum free medium accumulate in G sub 1 phase of the cell cycle. It is demonstrated that the surface membrane potential difference (PD) decreases immediately after changing serum free medium against culture medium containing either calf serum or the isolated serum protein; the original PD is restored 2 to 3 hours later. Serum protein without growth stimulating activity does not affect the PD. A permanent rat cell line which grows independently of serum was also tested. The PD of these cells is not significantly influenced by calf serum. Author

N72-24072*# Scientific Translation Service, Santa Barbara, Calif.
MALIGNANT TUMORS AND MICROORGANISMS
D. Gericke Washington NASA Jun. 1972 12 p refs Transl. into ENGLISH from Fortschr. Med. (Munich), v. 89, no. 1, 1971 p 32-35
(Contract NASw-2035)
(NASA-TT-F-14302) Avail: NTIS HC $3.00 CSCL 06E

An attempt was made to determine the extent of interactions between microorganisms and malignant tumors. Microplasms, the smallest microorganisms in nature, together with a carcinogenic, are capable of producing leukemia in mice. The immunological situation of a tumor carrier can be influenced favorably by application of vaccines, such as for example BCG, or of preparations made from microorganisms. Finally, the dissolution of the tumor tissue, called oncolysis, by clostridia is described. Author

N72-24073*# Stanford Research Inst., Menlo Park, Calif.
EFFECTS OF AIRCRAFT NOISES ON THE SLEEP OF WOMEN Final Report, 2 Feb. - 31 Oct. 1971
Jerome S. Lukas and Mary Ellen Dobbs Washington NASA Jun. 1972 39 p refs
(Contract NAS1-10528; SRI Proj. 1072)
(NASA-CR-2041) Avail: NTIS HC $3.00 CSCL 06P

The electroencephalographic and behavioral responses during sleep of eight women subjects, aged 29 to 49 years, to subsonic jet flyover noise and simulated sonic booms were tested over 14 consecutive nights. Stimulus intensities were 101, 113, and 119 PNdB (as if measured out-of-doors) for the subsonic jet flyover and 0.67, 2.50, and 5.0 psf (as if measured out-of-doors) for the simulated sonic booms. It was found that the women were awakened, on the average, by approximately 42 percent of the flyover noises and by approximately 15 percent of the simulated sonic booms. Comparison of the results of this study with those of a similar study using men as subjects revealed that women were awakened more frequently by the subsonic jet flyover noise then were the men, while men were awakened more frequently by the simulated sonic boom. Author

N72-24074# Royal Aircraft Establishment, Farnborough (England).
THE EFFECT OF RANDOM VIBRATIONS OF A LIMITED FREQUENCY BAND COMPARED WITH SINUSOIDAL VIBRATIONS ON HUMAN BEINGS
H. Dupuis, E. Hartung, and L. Louda Apr. 1972 54 p refs Transl. into ENGLISH from "Vergleich Regelloser Schwingungen eines Bergrenzten Frequenzbereiches mith Sinusfoermigen Schwingungen Hinsichlich der Einwirkung auf den Menschen", Max-Planck Inst. for Agr. Work and Tech., Bad Kreuznach
(RAE-Lib-Trans-1603; BR28903) Avail: NTIS HC $4.75

Work aimed at finding out whether or not the methods of subjective evaluation established for sinusoidal vibration could be extended to mixtures of sinusoidal vibrations and random vibrations is outlined. Four main experiments are covered (1) detection levels and tolerance limits for sinusoidal vibration, (2) detection levels for one vibration component in a mixture of two sinusoidal vibrations, (3) tolerance limits for a mixture of two sinusoidal vibrations and (4) estimated intensity of a stochastic vibration compared with a simple sinusoidal vibration. Author

N72-24075*# Techtran Corp., Glen Burnie, Md.
REVIEW OF THE WORK OF THE LABORATORY OF M. I. VOLSKIY ON THE ASSIMILATION OF ATMOSPHERIC NITROGEN BY HIGHER ORGANISMS
Ye. N. Mishustin Washington NASA May 1972 21 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Biol. (Moscow), no. 4, 1971 p 647-655
(Contract NASw-2037)
(NASA-TT-F-14274) Avail: NTIS HC $3.25 CSCL 06C

A critical review is presented of works published by the M. I. Volskiy Laboratory and by others on the assimilation of nitrogen by the higher organisms of man, animals, and plants. M. I. Volskiy tries to prove that all organisms fix molecular nitrogen, regardless of symbiosis with microorganisms. Critical analysis reveals, however, that such statement is unfounded. Volskiy's experiments were not reproducible. M. I. Volskiy does not use the literature objectively and ignores materials that are contradictory to his veiws. Existing evidence proves that only lower life forms are capable of fixing nitrogen. Author

N72-24076*# California Univ., Berkeley. Lawrence Radiation Lab.
LIGHT FLASH PHENOMENON SEEN BY ASTRONAUTS
T. F. Budinger (Calif. Univ., Berkeley. Lawrence Berkeley Lab.), C. A. Tobias (Calif. Univ., Berkeley. Lawrence Berkeley Lab.), J. T. Lyman (Calif. Univ., Berkeley. Lawrence Radiation Lab.), P. K. Chapman (Wash. Univ., Seattle), L. S. Pinsky, H. Bichsel, J. D. Denney (Wash. Univ., Seattle), and W. B. Nelp (Wash. Univ., Seattle) 1971 45 p refs Presented at ESRO Colloq. on Space Biol. Related to the Post-Apollo Program, Paris, 15-17 Mar. 1971 Prepared in cooperation with Calif. Univ., Berkeley. Lawrence Berkeley Lab. and Wash. Univ., Seattle
(Contracts W-7405-eng-48; AT(45-1)-2225; Grant CA-12-446)
(NASA-TM-X-68419; LBL-31) Avail: NTIS HC $4.25 CSCL 06P

The results from experiments conducted to characterize and elucidate light flashes seen by astronauts on Apollo 11, 12, 13,

and 14 during transluna or transearth orbit are presented. The data show cosmic nuclei interacting with the visual apparatus causes the light flash phenomenon. The data also suggest that slow protons and helium ions with a stopping power greater than 10 KeV/micron will cause light flashes and streaks in the partially dark adapted eye. The effects of galactic cosmic nuclei interacting with man during long term missions are discussed.
E.H.W.

N72-24077# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).
AN IRRADIATION FACILITY WITH LIGHT AT WAVELENGTHS BETWEEN 250 AND 650 nm
D. N. vanHoytema Jan. 1972 27 p refs In DUTCH; ENGLISH summary
(MBL-1972-1; TDCK-59610) Avail: NTIS HC $3.25

An apparatus was constructed with which biological materials can be irradiated with light at various wavelengths and with a high intensity, making use of a 100 W superhigh pressure mercury lamp and a Beckman prism monochromator. The intensity of the monochromatic light is measured with a UV-sensitive photomultiplier. The equipment is calibrated by means of the uranyl oxalate actinometer system (+ or - 3 %). At lambda = 313.0 nm with a slitwidth of 2.0 mm (half-intensity band width 20 nm) the dose rate is 10.2 erg/sq mm sec.
Author

N72-24078# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
LOWER CARBONIFEROUS SPORES FROM THE BONAPARTE GULF BASIN, WESTERN AUSTRALIA AND NORTHERN TERRITORY
Geoffrey Playford 1971 111 p refs
(Bull-115) Avail: NTIS HC $7.75

Well preserved assemblages of plant microfossils have been recovered from Lower Carboniferous sediments, principally or entirely marine in origin and Visean in age, encountered in four boreholes in the landward Bonaparte Gulf Basin of Western Australia and Northern Territory. The 55 species of plant microfossils recognized are distributed among 32 genera of trilete sporae dispersae, including one new genus, Exallospora, which is instituted for the reception of distally annulate cingulate forms having typically verrucate sculptural elevations. Twenty-two species are referable (six tentatively so) to previously established taxa. The palynological flora is dominated by the pan-Australian, Famennian to mid-Carboniferous species Granulatisporites frustulentus Balme P. Hassell, which accounts for 44-83 percent of the spore populations. Certain spore forms, either the same as or closely similar to species known from Northern Hemisphere Lower Carboniferous sediments, lend confirmation to the Visean age previously adduced from the contained fauna. The palynological flora were compared with few currently known from the Australian Carboniferous System, and with those documented from relatively numerous Northern Hemisphere sequences of Lower Carboniferous age.
Author

N72-24079# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
LATE UPPER CAMBRIAN TRILOBITES FROM THE GOLA BEDS, WESTERN QUEENSLAND
J. H. Shergold 1971 133 p refs
(Bull-112) Avail: NTIS HC $8.75

The trilobite fauna of the Gola Beds, an informally designated stratigraphical unit of late Upper Cambrian age outcropping along the Momedah anticline in the Boulia area, western Queensland, are described. On the basis of their trilobites the Gola Beds are provisionally considered correlatives of the late Franvonian to early Trempealeauan interval of North America, and of the Fengshanian of north China, Korea, and Manchuria. Of the 19 genera described, 10 are new; and of the 25 species, 21 are described for the first time and four are left under open nomenclature owing to lack of material. Although the fauna is largely new, about one-third of it has affinity with species previously described from North America, notably the pseudagnostinids, richardsonellinids, and the ptychoprioids Dellea(?) and Lorrettina. A further third has affinity with east Asian species in this case the Kaolishaniidae, Saukiidae, and Shumardiidae. Only some agnostids show much affinity with trilobites from South America, Europe, and the USSR.
Author

N72-24080# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bad Godesberg (West Germany). Inst. fuer Flugmedizin.
DECREASES IN PSYCHOMOTOR PERFORMANCE DUE TO OXYGEN-DEFICIENCY IN THE RANGE BETWEEN THE THRESHOLDS OF REACTION AND IMPAIRMENT
H. D. Eichel 1972 64 p refs In GERMAN; ENGLISH summary
(DLR-FB-72-02) Avail: NTIS HC $5.25; DFVLR Porz-Wahn: 16,90DM

The psychomotor performance of 12 subjects was tested for 5 hours at normal atmospheric conditions and in a low pressure chamber at altitudes of 2000, 3000 and 4000 m INA. At the same time pulse rate, respiratory volume and O2-uptake were measured. At the threshold of reaction (2000 m), no decrease in psychomotor performance was found, at an altitude of 3000 m, however, a noticeable impairment was observed, which could be compensated only temporarily within the 5 hours of experimental time. At the threshold of impairment (4000 m) finally, a considerable decrease in psychomotor performance was found. Obviously the duration of the exposure was the most important factor, which may explain contradictory results of former literature, where performance decrements were found at altitudes not lower than 4000 m. The resting values of the physiological parameters showed the well known changes with increasing altitudes. Their responses to the psychomotor performance test, however, did not differ significantly under all experimental conditions. Therefore, they do not reflect the observed impairments of psychomotor performance. For practical purposes it may be concluded from these results, that the normally used cabin pressure does not affect the performance of air crews, whereas further decreases in cabin pressure to 3000 or 4000 m for longer time periods may be critical with respect to a higher risk in flight safety.
Author

N72-24081# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
THE USE OF BIOMEDICAL PROGRAMS PACKAGES
C. Sandi (IBM, Italy) 23 Jun. 1971 49 p In ITALIAN; ENGLISH summary Presented at 3D Programming Course on the Appl. of Elec. Computers in Biol. and Med., Rome, 30 Nov. 1970 - 7 Mar. 1971
(ISS-71/14) Avail: NTIS HC $4.50

The course concerning computer programming in the biomedical field is reported. Topics discussed include: statistical methods, probability functions, interdependence of variables, regression analysis, matrices, and analysis of variances. An example of the application of computer techniques to the influence of vaccination on the distribution of illness is included.
Transl. by F.O.S.

N72-24082# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
AUTOMATIC RECORDING OF PSYCHIATRIC DATA
D. Giucci, P. Pancheri (Rome Univ.), L. Pastena (Rome Univ.), and D. Veggetti 9 Jun. 1971 49 p refs In ITALIAN; ENGLISH summary
(ISS-71/12) Avail: NTIS HC $4.50

A program for the thorough arrangement of automatic recording of psychiatric data is illustrated. Such a program is compiled in FORTRAN 4 language for IBM 7040 computer and allows four different proceedings on the data: data transfer from punched cards onto tape-record; new data recording; their elimination, when necessary; and duplication of tape records. The use of the program is illustrated and explanations of the relative outputs are given.
Author

N72-24083# Naval Air Development Center, Johnsville, Pa. Crew Systems Dept.
HYPOTHERMIA IN CATS DURING PHYSICAL RESTRAINT
Russell D. Squires, Frank H. Jacobson, and George E. Bergey 29 Oct. 1971 25 p refs
(ZR110101)
(AD-735883; NADC-CS-7117) Avail: NTIS CSCL 06/19

The hypothermia which sometimes occurred in cats during physical restraint was on the average accompanied by decreased heat production and by increased heat loss. These changes were facultative rather than obligatory correlates of physical restraint and/or the unfamiliar surroundings in which which the restraint took place. The decreased heat production was due to a temporary attenuation or loss of the increase in oxygen consumption rate which follows a decrease in medial preoptic and anterior hypothalamic temperature, and the increased heat loss appeared to be largely due to temporary hyperventilation. It was suggested that an emotional response to the stress of physical restraint induced a reversible change (S) within the medial preoptic region and the anterior hypothalamus which somehow temporarily modified the normal medial preoptic and anterior hypothalamic thermoregulatory response to a decline in core temperature. Author (GRA)

N72-24084# Johns Hopkins Univ., Baltimore, Md. Dept. of Psychology.
EVOLUTION OF PSYCHOLOGICAL FRAMES OF REFERENCE Final Report, 1 Sep. 1966 - 31 Aug. 1971
William Bevan and Howard E. Egeth Jan. 1972 14 p refs
(Contract N00014-67-A-0163-0001; NR197011)
(AD-736382; TR-69) Avail: NTIS CSCL 05/10

The framework for much of the research has been the theory of adaptation level. In the area of perception, this research has shown the importance of context in metacontrast suppression, binocular rivalry, lightness scaling, size judgment, lightness judgment, Gestalt organization, and multidimensional sti mulus classification. Some effort was made to extend the analysis of context effects to memory. In general, this involved the analysis of relations among the stimuli used in learning and memory tasks. Thematic relevance of stimuli was studied in free recall and paired-associates learning. Other studies investigated memory as a function of the abstractness and variability of stimuli. Finally, some experiments on visual search were conducted to determine the conditions under which the elements in visual displays were processed serially or in parallel. Author (GRA)

N72-24085# Massachusetts Inst. of Tech., Cambridge.
FACTORS AFFECTING DEPTH PERCEPTION Annual Report
Whitman A. Richards Dec. 1971 19 p refs
(Contract F44620-69-C-0108; AF Proj. 9777)
(AD-736955; AFOSR-72-0335TR) Avail: NTIS CSCL 06/16

The report describes ongoing work on certain factors that affect depth perception. Of particular interest is that a sizeable portion (30%) of the population are unable to make full use of the binocular parallax cue for judging the distance of objects. These individuals are said to be stereoanomalous. Work over the past year has shown that these individuals localize objects in space in a manner different from other individuals who possess the full stereoscopic capability. A considerable effort has been spent in developing a simple, portable test for diagnosing the presence of stereoanomalies. Tests based upon random dot patterns appear to be satisfactory. One important distinction that emerges concerns two separate systems for stereopsis in the normal observer: one sensitive to positional changes in depth, and a second parallel system that requires object motion. GRA

N72-24086# RAND Corp., Santa Monica, Calif.
BIOMEDICAL DATA PROCESSING
E. C. DeLand Oct. 1971 70 p refs
(AD-737676; P-4718) Avail: NTIS CSCL 06/5

The tasks involved in insinuating computer-based technology into the practice of medicine have proved for a variety of reasons considerably more difficult than was first assumed. Clearly, though, certain signs of progress are at hand, and these are explored. The computer is increasingly being used in data handling and automation tasks related to routine activities of health care. Gradually, as we learn how to control costs and to adapt the hardware and software systems to the more complicated and subtle medical care environments, their utility will expand. The state-of-the-art of the utilization of computer technology in medical services is reviewed. GRA

N72-24098# Joint Publications Research Service, Arlington, Va.
DYNAMICS OF THE CONTENT OF CARBON MONOXIDE IN AN ATMOSPHERE REGENERATED BY CHLORELLA
A. I. Kazakov, G. I. Meleshko, and Yu. V. Pepelyayev *In its* Space Biol. and Med., Vol. 6, No. 2, 1972 18 May 1972 p 18-22 refs (See N72-24096 15-05)
Avail: NTIS HC $9.50

N72-24099# Joint Publications Research Service, Arlington, Va.
SOME INDICES OF THE GROWTH OF RATS AND THEIR SKELETAL MUSCLES DURING PROLONGED RESTRICTION OF MOBILITY
A. M. Potapov *In its* Space Biol. and Med., Vol. 6, No. 2, 1972 18 May 1972 p 23-30 refs (See N72-24096 15-05)
Avail: NTIS HC $9.50

N72-24100# Joint Publications Research Service, Arlington, Va.
ERYTHROCYTE RESERVE IN HEALTHY AND CHRONICALLY IRRADIATED DOGS
A. V. Ilyukhin, L. L. Semashko, A. G. Izergina, and B. A. Markelov *In its* Space Biol. and Med., Vol. 6, No.2, 1972 18 May 1972 p 31-36 refs (See N72-24096 15-05)
Avail: NTIS HC $9.50

N72-24101# Joint Publications Research Service, Arlington, Va.
STATE OF NATURAL IMMUNITY OF DOGS DURING CHRONIC GAMMA IRRADIATION UNDER THE INFLUENCE OF AMITETRAVITE
S. I. Palmina, V. A. Zuyeva, N. I. Gvozdeva, M. F. Sbitneva, A. A. Akhunov, and E. S. Zubenkova *In its* Space Biol. and Med., Vol. 6, No. 2, 1972 18 May 1972 p 37-45 refs (See N72-24096 15-05)
Avail: NTIS HC $9.50

N72-24102# Joint Publications Research Service, Arlington, Va.
EFFECT OF SYNTHETIC CARBOHYDRATES ON RAT LIVER LYSOSOMES
G. F. Shemanova, Yu. Ye. Sinyak, and V. I. Gorshkova *In its* Space Biol. and Med., Vol. 6, No. 2, 1972 18 May 1972 p 46-50 refs (See N72-24096 15-05)
Avail: NTIS HC $9.50

N72-24103# Joint Publications Research Service, Arlington, Va.
CARDIAC ACTIVITY CHANGES IN DOGS DURING ACUTE OVERHEATING AND THE PROGNOSTIC IMPORTANCE OF ELECTROCARDIOGRAPHIC DATA
B. M. Fedorov, E. A. Musinov, V. V. Zhuravlev, and V. P. Krotov *In its* Space Biol. and Med., Vol. 6, No. 2, 1972 18 May 1972 p 51-59 refs (See N72-24096 15-05)
Avail: NTIS HC $9.50

N72-24104# Joint Publications Research Service, Arlington, Va.
CARDIAC ELECTRIC ACTIVITY ACCOMPANYING DIFFERENT DEGREES OF DECOMPRESSION OF THE LOWER HALF OF THE BODY
V. G. Voloshin and L. Ya. Divina *In its* Space Biol. and Med., Vol. 6, No. 2, 1972 18 May 1972 p 60-67 refs (See N72-24096 15-05)
Avail: NTIS HC $9.50

N72-24106# Joint Publications Research Service, Arlington, Va.
VASCULAR TONE IN DIFFERENT PARTS OF THE BODY DURING PROLONGED RESTRICTION OF MUSCULAR ACTIVITY
N. Ye. Panferova *In its* Space Biol. and Med., Vol. 6, No. 2, 1972 18 May 1972 p 74-79 refs (See N72-24096 15-05)
Avail: NTIS HC $9.50

N72-24107# Joint Publications Research Service, Arlington, Va.
INCREASING THE FUNCTIONAL CAPACITY OF THE HUMAN CARDIOVASCULAR SYSTEM BY THE REGULATED COOLING METHOD
A. A. Stikharev *In its* Space Biol. and Med., Vol. 6, No. 2, 1972 18 May 1972 p 80-88 refs (See N72-24096 15-05)
Avail: NTIS HC $9.50

N72-24110# Joint Publications Research Service, Arlington, Va.
STUDY OF WATER-MINERAL METABOLISM DURING RESTRICTED MOTOR ACTIVITY
V. P. Krotov *In its* Space Biol. and Med., Vol. 6, No. 2, 1972 18 May 1972 p 106-118 refs (See N72-24096 15-05)
Avail: NTIS HC $9.50

N72-24112# Joint Publications Research Service, Arlington, Va.
PULSE RATE ADAPTATION DURING CHANGE IN THE SLEEP-WAKEFULNESS RHYTHM
S. I. Stepanova *In its* Space Biol. and Med., Vol. 6, No. 2, 1972 18 May 1972 p 129-135 ref (See N72-24096 15-05)
Avail: NTIS HC $9.50

N72-24123# Joint Publications Research Service, Arlington, Va.
ROLE OF PECULIARITIES IN EXTERNAL STRUCTURE IN THE HYDRODYNAMICS OF HIGH-SPEED FISH
G. F. Kobets and M. L. Komarova *In its* Bionics 15 May 1972 p 157-167 refs (See N72-24117 15-05)
Avail: NTIS HC $12.75

N72-24131# Joint Publications Research Service, Arlington, Va.
INVESTIGATING THE LANGUAGE AND INTELLECT OF DOLPHINS
I. M. Kreyn *In its* Cybernetics and Computer Technol. 9 May 1972 p 38-44 refs (See N72-24126 15-05)
Avail: NTIS HC $5.50

05 BIOTECHNOLOGY

Includes life support systems, human engineering, protective clothing and equipment; crew training and evaluation, and piloting. For related information see also: 04 Biosciences.

N72-24087*# Systems Technology, Inc., Hawthorne, Calif.
PILOT DYNAMICS FOR INSTRUMENT APPROACH TASKS: FULL PANEL MULTILOOP AND FLIGHT DIRECTOR OPERATIONS
David H. Weir and Duane T. McRuer Washington NASA May 1972 107 p refs
(Contract NAS2-5690)
(NASA-CR-2019) Avail: NTIS HC $3.00 CSCL 05H

Measurements and interpretations of single and mutiloop pilot response properties during simulated instrument approach are presented. Pilot subjects flew Category 2-like ILS approaches in a fixed base DC-8 simulaton. A conventional instrument panel and controls were used, with simulated vertical gust and glide slope beam bend forcing functions. Reduced and interpreted pilot describing functions and remnant are given for pitch attitude, flight director, and multiloop (longitudinal) control tasks. The response data are correlated with simultaneously recorded eye scanning statistics, previously reported in NASA CR-1535. The resulting combined response and scanning data and their interpretations provide a basis for validating and extending the theory of manual control displays. Author

N72-24088*# Baylor Univ., Houston, Tex.
ANALYSIS OF BIOELECTRIC RECORDS AND FABRICATION OF PHOTOTYPE SLEEP ANALYSIS EQUIPMENT Final Report
Peter Kellaway 25 Feb. 1972 18 p refs
(Contract NAS9-11120)
(NASA-CR-115551) Avail: NTIS HC $3.00 CSCL 06B

A computer-analysis technique was used to evaluate the changes in the waking EEG's of 5 normal subjects which occurred during the oral administration of flurazepam hydrochloride (Dalmane). While the subjects were receiving the drug, there was an increase in the amount of beta (14-38 c/sec) activity in fronto-central EEG leads in all 5 subjects. This increase in beta activity was characterized by a highly consistent increase in the number of waves that occurred during an EEG recording interval of fixed duration and by a less consistent increase in average wave amplitude. There was no detectable change in mean EEG wavelength (frequency) within the beta frequency range. The EEG patterns reverted to their baseline condition during 2-3 weeks after withdrawal of the drug. Analysis of the alpha, theta and delta components of the EEG indicated no changes during or following administration of the drug. This study clearly illustrates the usefulness of specific computer-analysis techniques in the characterization and quantification of sleep-promoting drugs upon the EEG of the normal young adults in the waking state. Two preamplifiers and 150 EEG monitoring caps with electrodes were delivered to MSC. Author

N72-24089# National Defence Research Organization TNO, Soesterberg (Netherlands). Inst. for Perception.
THE INVESTIGATION OF A POSSIBLE RELATIONSHIP BETWEEN VESTIBULAR STIMULATION AND SIZE PERCEPTION BY MEANS OF A PARALLEL SWING
F. Philip vanEyl 1971 12 p refs
(IZF-1971-23; TDCK-58928) Avail: NTIS HC $3.00

Vestibular stimulation was induced by having S travel on a 3.8 second parallel swing. Two luminous disks were fixed to the swing in S's median and horizontal plane and two at angles of 40 and 80 degrees, respectively. One of the two horizontal disks was the comparison stimulus. The diameter of that stimulus was changed in ascending and descending fashion. Each standard stimulus was presented individually for three seconds in a standing-still position. the pushbutton release of the swing terminated the standard stimulus and activated the comparison stimulus for .2 seconds when S had reached his return point or when he had traveled three quarters of the complete swing. Three male S's verbally made bigger and smaller responses to the comparison stimulus with the non-dominant eye covered. For all responses to each condition of six ascending and descending stimuli the points between larger and smaller responses were computed and submitted to an analysis of variance. The results showed significant differences between the 0, 40, and 80-degree conditions ($p<.01$) and a significant interaction between these conditions and S's ($p<.01$). Author

N72-24090# National Defence Research Organization TNO, Soesterberg (Netherlands).
THE INFLUENCE OF CORIOLIS STIMULATION IN DIFFERENT GROUPS OF PERSONNEL OF THE ROYAL AIR FORCE
A. J. Boezeman, A. F. Sanders, and W. A. Wagenaar 1971 19 p refs In DUTCH; ENGLISH summary
(IZF-1971-19; TDCK-58342) Avail: NTIS HC $3.00

The effect of flying experience in providing the ability to perform coordinated actions while subjected to Coriolis acceleration is discussed. Tests were conducted on three groups of personnel with varying levels of flying experience. Head

movements were made during rotation of the centrifuge to elicit Coriolis stimulation and response times of a head movement and a binary choice task were registered. It was concluded that Coriolis stimulation increases the choice reaction times, but repeated exposure to Coriolis induced a decrease in reaction times. Previous flying experience did not contribute to reduced reaction times. Author

N72-24091# National Defense Research Organization TNO, The Hague (Netherlands). Physics Lab.
PERCEPTIBILITY OF MILITARY TARGETS WITH PASSIVE INFRARED SYSTEMS AS A FUNCTION OF THERMAL AND GEOMETRIC RESOLUTION. PART 1: DEFINITION OF PROBLEM AND DESCRIPTION OF EQUIPMENT
A. N. deJong and A. J. Vialle Aug. 1971 23 p refs
(PHL-1971-34; TDCK-58542) Avail: NTIS HC $3.25

A description is given of a system that is able to degrade pictures in a well defined way. The size of the scanning spot is variable and the amount of noise, added to the signal is changed in relation to the spot size. The aim is to find the optimum spot size, that gives the human observer, who is observing a terrain, the best information score concerning the identification of military targets. The parameters of the systems are particularly adapted to thermal infrared observation and imaging devices. Author

N72-24092*# Methodist Hospital, Houston, Tex. Neurophysiology Service.
MODIFIED AND IMPROVED SLEEP MONITORING DISPLAY CONSOLE
James D. Frost, Jr. 31 Mar. 1972 10 p
(Contract NAS9-12528)
(NASA-CR-115573) Avail: NTIS HC $3.00 CSCL 06B

An outline is given of a sleep monitoring display console capable of simultaneously displaying: (1) the visible current sleep stage of each subject, (2) a cumulative, numerical display (in hours and minutes) of the total amount of time the subject spends in each stage, and (3) a stepwise, graphic recording of subject's sleep stage versus time. Author

N72-24093*# George Washington Univ., Washington, D.C.
THE PUBLIC HEALTH SERVICE GUIDELINES. GOVERNING RESEARCH INVOLVING HUMAN SUBJECTS: AN ANALYSIS OF THE POLICY-MAKING PROCESS
Mark S. Frankel Feb. 1972 69 p refs
(Grant NGL-09-010-030)
(NASA-CR-126642; GWPS-Mon-10) Avail: NTIS HC $5.50 CSCL 05E

The policy making process which led to development of the Public Health Service Guidelines governing research involving human subjects is outlined. Part 1 examines the evolution of PHS Guidelines, tracing (1) evolution of thought and legal interpretation regarding research using human subjects; (2) initial involvement of the Federal government; (3) development of the government's research program; (4) the social-political environment in which formal government policy was developed; and (5) various policy statements issued by the government. Part 2 analyzes the process by which PHS Guidelines were developed and examines the values and other underlying factors which contributed to their development. It was concluded that the evolution of the Guidelines is best understood within the context of a mixed-scanning strategy. In such a strategy, policy makers make fundamental decisions regarding the basic direction of policy and subsequent decisions are made incrementally and within the contexts set by the original fundamental decisions. Author

N72-24094# Ohio State Univ., Columbus. Aviation Medicine Research Lab.
THE EFFECTS OF ALCOHOL ON PILOT PERFORMANCE DURING INSTRUMENT FLIGHT
Charles E. Billings, Robert L. Wick, Jr., Ralph J. Gerke, and Robert C. Chase Jan. 1972 79 p refs
(Contract DOT-FA68AC-6089-2; FAA Proj. RF-2626)
(FAA-AM-72-4) Avail: NTIS HC $6.00

Sixteen instrument-rated pilots, eight of whom were very experienced professional aviators, flew Instrument Landing System approaches in a Cessna 172 under simulated instrument flight conditions while sober and while under the influence of 40, 80, and 120 mg% of blood ethyl alcohol. Each pilot flew four approaches to minimums on each of two occasions at each alcohol level. The data collected during these approaches included continuous measurement of aircraft position with respect to localizer and glide path centerlines and airspeed. Note was made of procedural errors committed during the flights. The subjects showed significant and progressive decremental effects of alcohol at all of the levels studied. The more experienced pilots maintained their ability to guide the aircraft better than did the less experienced subjects, particularly at high levels of blood alcohol. Both groups, however, demonstrated progressive increases in the number and seriousness of procedural errors with increasing levels of alchohol. It is concluded that even 40 mg% of blood alcohol exerts decremental effects on performance which are incompatible with flight safety. Author

N72-24095# Civil Aeromedical Inst., Oklahoma City, Okla.
EVALUATION OF A FIBERGLASS INSTRUMENT GLARE SHIELD FOR PROTECTION AGAINST HEAD INJURY
E. D. Langston and John J. Swearingen Feb. 1972 13 p refs
(FAA Proj. AM-A-71-PRS-47)
(FAA-AM-72-7) Avail: NTIS HC $3.00

An all fiberglass prototype glare shield was evaluated in terms of head injury protection. In 30-ft./sec. head impacts, the 91/2-inch protrusion folded down over the heavy instruments, offering significant improvement in head injury protection when compared to current aircraft instrument panel designs. However, in this particular design the fiberglass broke, allowing the forehead to contact a thin, sharp edge with sufficient force to produce fatal head injuries. Design changes to eliminate this fracture point and incorporation of fiberglass glare shields of similar design in future general aviation aircraft could lead to a significant reduction of head injuries during crash decelerations. Author

N72-24096# Joint Publications Research Service, Arlington, Va.
SPACE BIOLOGY AND MEDICINE, VOLUME 6, NO. 2, 1972
O. Z. Gazenko, ed. 18 May 1972 147 p refs Transl. into ENGLISH of "Kosmicheskaya Biologiya i Meditsina" Moscow, Meditsina Publishing House
(JPRS-56030) Avail: NTIS HC $9.50

Articles concerning the selection and training of cosmonauts are presented. Data cover: evaluation and analysis of accumulated data to facilitate the on-going transition from orbital to interplanetary flights; research aimed at guaranteeing safety on long flights and reliability of the human component of the man-spaceship system; space psychology and physiology; and environmental problems and control (spacecraft habitability, effects of radiation, and weightlessness) and telemetry. For individual titles, see N72-24097 through N72-24114.

N72-24097# Joint Publications Research Service, Arlington, Va.
PERFORMANCE, METHODS OF EVALUATING IT, AND DRUG STIMULATION
V. S. Shashkov and N. V. Gordeycheva *In its* Space Biol. and Med., Vol. 6, No.2, 1972 18 May 1972 p 1-17 refs (See N72-24096 15-05)
Avail: NTIS HC $9.50

The methods used to determine the qualitative and quantitative characteristics of man's physical performance are outlined. Data cover onset of fatigue, maximum oxygen consumption, changes in biological rhythms, changes in bioelectrical activity, and biochemical changes in the body. The use of drugs as a means of enhancing performance is also discussed. An extensive bibliography is included. E.H.W.

N72-24098# Joint Publications Research Service, Arlington, Va.
DYNAMICS OF THE CONTENT OF CARBON MONOXIDE IN AN ATMOSPHERE REGENERATED BY CHLORELLA **c04**

A. I. Kazakov, G. I. Meleshko, and Yu. V. Pepelyayev *In its* Space Biol. and Med., Vol. 6, No. 2, 1972 18 May 1972 p 18-22 refs (See N72-24096 15-05)
Avail: NTIS HC $9.50

Experimental results indicating that carbon monoxide can be accumulated in the enclosed environment of a Chlorella reactor in a man-Chlorella system and remain at a relatively constant level are presented. The stabilized level of the carbon monoxide content in an enclosed atmosphere may vary. It is likely to be associated with the photosynthetic activity of Chlorella cells, which as was shown previously, may absorb carbon monoxide from the atmosphere. Author

N72-24099# Joint Publications Research Service, Arlington, Va.
SOME INDICES OF THE GROWTH OF RATS AND THEIR SKELETAL MUSCLES DURING PROLONGED RESTRICTION OF MOBILITY **c04**

A. M. Potapov *In its* Space Biol. and Med., Vol. 6, No. 2, 1972 18 May 1972 p 23-30 refs (See N72-24096 15-05)
Avail: NTIS HC $9.50

The exposure of rats to prolonged hypokinesia for four months resulted in the delayed growth of the animals, their corpses, and skeletal muscles. The inhibitory effect of hypokinesia on the development of the animals and their muscles was most distinct during the second experimental month. The exposure produced a greater effect on the growth of the flexors in the ankle joint than on the extensors. Author

N72-24100# Joint Publications Research Service, Arlington, Va.
ERYTHROCYTE RESERVE IN HEALTHY AND CHRONICALLY IRRADIATED DOGS **c04**

A. V. Ilyukhin, L. L. Semashko, A. G. Izergina, and B. A. Markelov *In its* Space Biol. and Med., Vol. 6, No.2, 1972 18 May 1972 p 31-36 refs (See N72-24096 15-05)
Avail: NTIS HC $9.50

Experimental data are given which help to quantitize the level at which the erythrocyte level of healthy and irradiated dogs is mobilized after a physical load. After running for 15 minutes on a treadmill at a speed of 5.2 km/ hour the healthy dogs released into the bloodstream 2.5 + or - 0.9% of the red blood cells of the total number of cells circulating in the blood. The most distinct index showing the state of the erythrocyte reserve is the reticulocytosis which develops in response to a given physical load. On the basis of data in the literature and experimental findings it was suggested that the erythrocyte reserve originates in the bone marrow. No significant differences in the quantitative reserve of erythrocytes in healthy and irradiated dogs was found. The animals were irradiated in total doses of 370, 565, 670, and 770 rad for 24, 36, 42 and 51 months respectively. Author

N72-24101# Joint Publications Research Service, Arlington, Va.
STATE OF NATURAL IMMUNITY OF DOGS DURING CHRONIC GAMMA IRRADIATION UNDER THE INFLUENCE OF AMITETRAVITE **c04**

S. I. Palmina, V. A. Zuyeva, N. I. Gvozdeva, M. F. Sbitneva, A. A. Akhunov, and E. S. Zubenkova *In its* Space Biol. and Med., Vol. 6, No. 2, 1972 18 May 1972 p 37-45 refs (See N72-24096 15-05)
Avail: NTIS HC $9.50

The effect of amitetravite, a biological protectant, on the state of natural immunity was investigated in experiments on dogs exposed to three year chronic gamma irradiation simulating the dose characteristics of a spaceflight environment. Long term irradiation of dogs with low Co-60 gamma ray dosages induced wavelike changes in the natural immunity of the test animals. Regular administration of amitetravite produced a normalizing effect on the state of skin autoflora, favored a relative stability of the indices of blood phagocytic activity, and restrained the development of autoimmune reactions. Author

N72-24102# Joint Publications Research Service, Arlington, Va.
EFFECT OF SYNTHETIC CARBOHYDRATES ON RAT LIVER LYSOSOMES **c04**

G. F. Shemanova, Yu. Ye. Sinyak, and V. I. Gorshkova *In its* Space Biol. and Med., Vol. 6, No. 2, 1972 18 May 1972 p 46-50 refs (See N72-24096 15-05)
Avail: NTIS HC $9.50

The effect of synthetic carbohydrates on rat liver lysosomes was examined. Since the carbohydrates were purified from contaminants they lost their toxicity for lysosomes. Author

N72-24103# Joint Publications Research Service, Arlington, Va.
CARDIAC ACTIVITY CHANGES IN DOGS DURING ACUTE OVERHEATING AND THE PROGNOSTIC IMPORTANCE OF ELECTROCARDIOGRAPHIC DATA **c04**

B. M. Fedorov, E. A. Musinov, V. V. Zhuravlev, and V. P. Krotov *In its* Space Biol. and Med., Vol. 6, No. 2, 1972 18 May 1972 p 51-59 refs (See N72-24096 15-05)
Avail: NTIS HC $9.50

Anesthesized dogs were exposed to acute overheating and their cardiovascular changes were examined in comparison with respiratory variations. The prognostic significance of the ECG ventricular spikes was noted during the period preceding the development of heat induced collapse. The changes in the voltage of the ECG waves during acute overheating were shown to be associated with several factors, the most important of which were adrenergic effects during early heating and hypoxia during late heating periods. Also described are the periods of overheating and the cardiac arrhythmias. The cardiovascular disturbances accompanying hyperthermia are discussed. Author

N72-24104# Joint Publications Research Service, Arlington, Va.
CARDIAC ELECTRIC ACTIVITY ACCOMPANYING DIFFERENT DEGREES OF DECOMPRESSION OF THE LOWER HALF OF THE BODY **c04**

V. G. Voloshin and L. Ya. Divina *In its* Space Biol. and Med., Vol. 6, No. 2, 1972 18 May 1972 p 60-67 refs (See N72-24096 15-05)
Avail: NTIS HC $9.50

A study was made of cardiac electric activity during applications of negative pressure of -40 and -80 mm Hg to the lower half of the body. The examinations revealed a significant increase in the heart rate, an increase in the R amplitude, and a decrease in the T amplitude, as well as displacement of the heart electric axis toward the vertical, related to the degree of decompression. During the first minutes of exposure changes in the R and T voltage and the electric position of the heart developed simultaneously but later occurred independently: the R variations were most distinct, T changes were least pronounced. These changes seemed to be associated not only with an impeded venous return to the heart and its reduced blood filling, but also with a redistribution of the specific weight of components of the cardiac autonomic innervation, the sympathetic innervation being predominant. Author

N72-24105# Joint Publications Research Service, Arlington, Va.
ULTRASONIC DOPPLER CARDIOGRAPHY IN A MEDICAL MONITORING SYSTEM

A. N. Kozlov *In its* Space Biol. and Med., Vol. 6, No. 2, 1972 18 May 1972 p 68-73 refs (See N72-24096 15-05)
Avail: NTIS HC $9.50

Due to its high information content, stability and comfortable conditions for signal monitoring, ultrasonic Doppler cardiography seems to be promising when used in medical evaluations of enclosed men. Use of narrow band filters, threshold limitations, and selection of the proper site for fixation of sensors make it possible to isolate a single complex from the ultrasonic Doppler cardiographic signal during every cardiac cycle for determining the heart rate in the medical monitoring system. Author

N72-24106# Joint Publications Research Service, Arlington, Va.
VASCULAR TONE IN DIFFERENT PARTS OF THE BODY DURING PROLONGED RESTRICTION OF MUSCULAR

ACTIVITY c04

N. Ye. Panferova *In its* Space Biol. and Med., Vol. 6, No. 2, 1972 18 May 1972 p 74-79 refs (See N72-24096 15-05)
Avail: NTIS HC $9.50

During a 120-day bedrest experiment four test subjects were examined for arterial tone by determining pulse wave propagation and venous tone by the use of occlusion plethysmography and skin temperature measurements. The above indices recorded for different body areas varied differently. The tone of veins and arteries in the legs, including skin arterioles, increased. The tone of head and hand veins remained unchanged. The tone of head and foot arteries decreased. The tone of large vessels of the elastic type, aorta, carotid artery, and arm artery, did not change. It is probable that variation in vascular tone is one of the mechanisms (supplementing endocrine regulation) which is responsible for regulating circulating blood volume during hypodynamia. Author

N72-24107# Joint Publications Research Service, Arlington, Va.
INCREASING THE FUNCTIONAL CAPACITY OF THE HUMAN CARDIOVASCULAR SYSTEM BY THE REGULATED COOLING METHOD c04

A. A. Stikharev *In its* Space Biol. and Med., Vol. 6, No. 2, 1972 18 May 1972 p 80-88 refs (See N72-24096 15-05)
Avail: NTIS HC $9.50

Hemodynamic changes were investigated in four volunteer test subjects during cooling experiments at -20 deg for 20, 40, 60, 90 or 120 minutes. The heat deficit was 0.9, 1.3, 1.6, 2.0 and 2.4 Cal/kg respectively. In the experiments the pulse rate decreased and the maximum, minimum and pulse pressures increased. The Kvaas tolerance coefficient decreased. The ECG revealed changes typical of cholinergic reactions. Change from a horizontal to a vertical position brought about a lesser heart rate increase and a smaller change in the minimum and pulse pressures in the test subjects than in the controls. The level of cardiovascular response at first increased linearly with the heat deficit; however, in the fourth and fifth experimental runs it was very close to that in the third run. After warming the cardiovascular function reached the pretest values in all 5 experimental runs. Author

N72-24108# Joint Publications Research Service, Arlington, Va.
ROLE OF HIGHER AUTONOMIC CENTERS IN THE MECHANISMS OF VESTIBULAR-AUTONOMIC REFLEXES

M. D. Yemelyanov and A. N. Razumeyev *In its* Space Biol. and Med., Vol. 6, No. 2, 1972 18 May 1972 p 89-97 refs (See N72-24096 15-05)
Avail: NTIS HC $9.50

Experimental data, describing the functional relationship between the vestibular system and the respiratory and vasomotor centers which were accumulated during adequate (swinging) and electric stimulation of the labyrinth are presented. The study revealed the relationships between the responses of neurons and the functional state of the centers. Also discussed are the mechanisms of vestibular-autonomic reactions with respect to peculiarities in the cerebellar function. Author

N72-24109# Joint Publications Research Service, Arlington, Va.
CHANGE IN REFLEX REACTION OF HUMAN MUSCLES DURING ADEQUATE VESTIBULAR STIMULATION

Ye. I. Paltsev and A. M. Elner *In its* Space Biol. and Med., Vol. 6, No. 2, 1972 18 May 1972 p 98-105 refs (See N72-24096 15-05)
Avail: NTIS HC $9.50

Experimental data on changes in the reflex excitability of human leg muscles in response to adequate vestibular stimulation (body rotation in the sagittal plane with an angular acceleration) are examined. Functional changes in the segmentary apparatus developed up to 15 to 20 msec after the onset of rotation. Variations in reflex excitability of different muscles in response to the same vestibular stimulation (direction of body rotation) were dissimilar. Changes in reflex excitability of the same muscle were also different in response to various vestibular stimuli. It is concluded that the vestibular apparatus may perform a coordinating function not only during quasistatic control of movements, but also during dynamic control. It is therefore believed that even short, latent muscular spinal reactions which appear in response to body movements may be governed by the vestibular apparatus. Author

N72-24110# Joint Publications Research Service, Arlington, Va.
STUDY OF WATER-MINERAL METABOLISM DURING RESTRICTED MOTOR ACTIVITY c04

V. P. Krotov *In its* Space Biol. and Med., Vol. 6, No. 2, 1972 18 May 1972 p 106-118 refs (See N72-24096 15-05)
Avail: NTIS HC $9.50

On the first day of hypokinesia plasma liquefaction was noted, accompanied by a decrease in the hematocritic index and the hemoglobin concentration. The plasma volume as calculated by the Strauss method was found to increase by 5.1%. During the three subsequent weeks of hypokinesia fluid redistributions occurred between the plasma and red blood cells. The potassium and sodium concentration in the plasma decreased with lengthening of hypokinesia. The pattern of changes in the plasma calcium concentration correlated with the variations in total blood serum protein. A study of variations in potassium and sodium content in the femur extensor and the back long muscle revealed no significant discrepancies in the changes in electrolyte content. The fluid redistribution in rabbits exposed to hypokinesia was studied by the indicator dilution method. The data obtained show the lack of dehydration of animals during their exposure to hypokinesia. Author

N72-24111# Joint Publications Research Service, Arlington, Va.
DIURNAL PERIODICITY OF THE HUMAN RESPIRATION RATE IN EXPERIMENTS WITH AN INVERSION OF THE WORK AND REST SCHEDULE

A. A. Lugovoy *In its* Space Biol. and Med., Vol. 6, No. 2, 1972 18 May 1972 p 119-128 refs (See N72-24096 15-05)
Avail: NTIS HC $9.50

Experiments were carried out on eight male test subjects who lived for 25 to 45 days in isolation chambers with controlled comfortable atmospheres. Exposure to an inverted (12-hour shift) work-rest cycle, the operation of ecological time sensors being excluded, brought about a gradual rearrangement of the diurnal rhythm of the respiration rate in accordance with the altered cycle. A study of the different patterns of adjustment to the new cycle revealed that the rearrangement developed the faster the greater was the sleep deficit during the transition. Endogenous and exogenous components of the diurnal rhythm of the respiration rate were detected. The endogenous component, which is related to the body's biological clock, is characterized by inertia, a relatively low rate of restructuring, whereas the exogenous component is dependent on the diurnal variations in human psychophysiological activity and changes simultaneously with changes in man's work-rest cycles. Author

N72-24112# Joint Publications Research Service, Arlington, Va.
PULSE RATE ADAPTATION DURING CHANGE IN THE SLEEP-WAKEFULNESS RHYTHM c04

S. I. Stepanova *In its* Space Biol. and Med., Vol. 6, No. 2, 1972 18 May 1972 p 129-135 ref (See N72-24096 15-05)
Avail: NTIS HC $9.50

Data are given to demonstrate that during habituation to a new work-rest cycle the diurnal heart rate rhythm develops gradually. An impression of adaptation of the frequency of cardiac contractions to an unusual life schedule may be given in those cases when the curve of its diurnal variation is constructed by combining indices obtained in two different body positions: lying and sitting up. Comparison of the indices registered around-the-clock in the same position will make it possible to determine the true times of pulse rate adaptation to a new sleep-wakefulness rhythm. Author

N72-24113# Joint Publications Research Service, Arlington, Va.
PECULIARITIES IN TIME PERCEPTION IN SIMULATED AND REAL FLIGHT
S. S. Almyashev, Ye. A. Derevyanko, and V. F. Zhernavkov *In its* Space Biol. and Med., Vol. 6, No. 2, 1972 18 May 1972 p 136-140 refs (See N72-24096 15-05)
Avail: NTIS HC $9.50

Experimental data accumulated concerning the peculiarities of time perception during real and simulated flights are presented. The level of distortion and the accuracy in reproducing stipulated time periods can be attributed to the different degree of nervous and emotional stress of the pilot (space pilot). This in turn depends on the complexity and the hazard of the task to be performed, that is, on flight conditions. During a real flight under normal meteorological conditions, as well as during a simulated flight, the stipulated time intervals are reproduced in an extended form. This is due to the presence of working dominant foci in the cortex of the large hemispheres. During flights in a complicated environment and at extremely low altitudes in a turbulent atmosphere the processes in the brain cortex are depressed by a generalized excitation induced by emotional stress. This results in shortening of the reproduced time intervals. Author

N72-24114# Joint Publications Research Service, Arlington, Va.
NEW METHOD FOR IMPLANTING ELECTRODES IN CHRONIC EXPERIMENTS
N. T. Svistunov *In its* Space Biol. and Med., Vol. 6, No. 2, 1972 18 May 1972 p 141-143 refs (See N72-24096 15-05)
Avail: NTIS HC $9.50

An electrode design and a method for implanting it into animal tissue are outlined. The electrode is a spiral with an emanating straight line lead in a silicone tube. It is suggested that such a design will prevent the breaking away of the electrode during chronic experiments. The device is also designed to cut down interelectrode resistance and conducting disruptions. E.H.W.

N72-24115# Civil Aeromedical Inst., Oklahoma City, Okla.
MULTIPLE TASK PERFORMANCE AS A PREDICTOR OF THE POTENTIAL OF AIR TRAFFIC CONTROLLER TRAINEES
W. Dean Chiles, Alan E. Jennings, and Georgetta West Jan. 1972 33 p refs
(FAA-AM-72-5) Avail: NTIS HC $3.75

Two hundred and twenty-nine Air Traffic Controller trainees were tested on the CAMI Multiple Task Performance Battery. The battery provides objective measures of monitoring, arithmetical skill, visual discrimination, and group problem solving. The criterion of trainee potential was based on ratings from FAA Academy instructors in courses being attended by the trainees. Five studies were conducted, the first one being in the nature of a pilot study for checking out procedures. The second study yielded a validity coefficient of .54. The third study yielded a coefficient of .53. The fourth study found no predictive power for the MTPB. The fifth study produced a coefficient of .24 for one method of computing the performance index and .46 for a second method. For each study, the coefficient is based on one hour of testing with about 50 minutes of preceding instruction and practice. It is concluded that the MTPB-approach to selection offers promise as a screening device for Air Traffic Control Specialist applicants, but further research is required to establish this as a fact and to determine its utility in terms of cost-effectiveness. Author

N72-24116*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DETERMINATION OF PILOT AND VEHICLE DESCRIBING FUNCTIONS FROM THE GEMINI 10 MISSION
Frederick G. Edwards Washington May 1972 37 p refs
(NASA-TN-D-6803; A-3877) Avail: NTIS HC $3.00 CSCL 05E

Three types of manual control maneuvers conducted during the Gemini-10 mission have been analyzed in order to measure and document the describing function of the pilot, the vehicle and the pilot-vehicle combination during an actual space mission. Measurements made from the data records of the reentry maneuver (a single axis control task) indicate that the pilot's control behavior changes during critical portions of the reentry. Measurements made of the deorbit maneuver and of a terminal phase initiation maneuver (three axis tasks) show that the pilot assigns priorities to the separate axes and controls them differently. His control technique is also influenced by the magnitude of the thrust disturbance present during the maneuvers. The results for all three types of maneuvers show that the pilot adapts to the nonlinear spacecraft control system in such a way that the combined pilot-vehicle dynamics take the form of the linear crossover model. Author

N72-24117# Joint Publications Research Service, Arlington, Va.
BIONICS
G. V. Logvinovich, ed. 15 May 1972 211 p refs Transl. into ENGLISH of Bionika (Kiev), no. 5, 1971 p 1-136
(JPRS-55982) Avail: NTIS HC $12.75

Applications of the characteristics of biological systems to mechanical systems are considered. Emphasis is placed on the velocity and hydrodynamic features of swimming vertebrates. For individual titles, see N72-24118 through N72-24125.

N72-24118# Joint Publications Research Service, Arlington, Va.
SOME CHARACTERISTICS OF THE HYDRODYNAMICS OF AN ENGINE OF THE FLAPPING WING TYPE c12
Yu. K. Savchenko *In its* Bionics 15 May 1972 p 10-22 refs (See N72-24117 15-05)
Avail: NTIS HC $12.75

Characteristics and advantages of a flapping wing engine patterned after wings found in nature are described, based on results obtained in an investigation of the hydrodynamics of a flapping wing on a specially designed oscillatory apparatus. A mathematical analysis of the kinematics is presented. The results of an approximation of the induced velocities from the eddy wakes of a flapping wing and a screw engine indicate that the losses in creating induced velocities in the entire variable range of the stepped angle are greater for a screw than for a wing. K.P.D.

N72-24119# Joint Publications Research Service, Arlington, Va.
BOUNDARY LAYER OF AN ANISOTROPIC FLUID c12
Ye. Yu. Taran and Yu. I. Shmakov *In its* Bionics 15 May 1972 p 52-59 refs (See N72-24117 15-05)
Avail: NTIS HC $12.75

An incompressible fluid was investigated, each of whose particles could be represented as an ellipsoid of revolution having a definite orientation dependent on flow. Rheological models are considered which account for anisotropy of molecular transfer and a dependence of the stress tensor on the direction associated with this orientation, patterned after solutions of high polymers. An approximation is presented for the boundary layer of a simple Ericksen anisotropic fluid. A stationary two-dimensional flow of a viscoelastic fluid is also considered near a solid boundary in the coordinate system used to approximate the boundary layer. Stability conditions are presented for the solutions to the equations. K.P.D.

N72-24120# Joint Publications Research Service, Arlington, Va.
STABILITY OF THE LAMINAR BOUNDARY LAYER ON A DEFORMABLE PLATE c12
L. V. Kondratyeva and V. V. Skripachev *In its* Bionics 15 May 1972 p 60-65 refs (See N72-24117 15-05)
Avail: NTIS HC $12.75

The stability of Blasius flow is considered near a deformable plate. In the linear formulation the problem of boundary layer flow stability was reduced to determining the nontrivial solution for the differential equation for the dimensionless stream function phi. The results of the computations are presented. It is shown that a deformable surface can exert an appreciable effect on the Reynolds number of stability loss. K.P.D.

N72-24121# Joint Publications Research Service, Arlington, Va.
EQUATIONS FOR A BOUNDARY LAYER ON A DEFORMABLE CONTOUR c12
V. M. Zhurva and Yu. I. Fadeyev *In its* Bionics 15 May 1972 p 66-74 refs (See N72-24117 15-05)
Avail: NTIS HC $12.75

The problem of the motion of a deformable body, as a model of an object in hydrobionics, in a viscous fluid, is considered. Assuming that a boundary layer exits during the movement of a deformable body in a fluid of low viscosity, the problem is divided into two parts: (1) that of the movement of a body in a nonviscous fluid (potential problem), and (2) the problem of a boundary layer effect on a deformable body. Translational and curvilinear motion of a deformable contour in a viscous, incompressible fluid are discussed and the equations of motion are presented. Author

N72-24122# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF SUPRAMOLECULAR STRUCTURES OF WATER-SOLUBLE POLYMERS AND THEIR ADSORPTION ACTIVITY c06
K. F. Lyashev and I. A. Dumanskiy *In its* Bionics 15 May 1972 p 152-156 refs (See N72-24117 15-05)
Avail: NTIS HC $12.75

The introduction of trace quantities of polymers, such as high molecular weight polyacrylamide, carboxymethyl cellulose, and polyethylene oxide, into the boundary layer zone to decrease turbulent friction is considered. An investigation was undertaken to determine the concentration range for which macromolecules are capable of structure formation in aqueous solutions of polymers used as antiturbulent admixtures. The adsorption capacity of macromolecules and their structure formation were estimated from the isotherms of surface tension of aqueous polymeric solutions. The type of supramolecular formations was determined using an electron microscope. It was concluded that in the concentration range of 0.003 to 2.00%, the observed decrease in turbulent drag was due mainly to the presence in the boundary layer of supramolecular formations of the block or fibril types. K.P.D.

N72-24123# Joint Publications Research Service, Arlington, Va.
ROLE OF PECULIARITIES IN EXTERNAL STRUCTURE IN THE HYDRODYNAMICS OF HIGH-SPEED FISH c04
G. F. Kobets and M. L. Komarova *In its* Bionics 15 May 1972 p 157-167 refs (See N72-24117 15-05)
Avail: NTIS HC $12.75

Hypotheses are considered concerning the hydrodynamic characteristics of fish capable of attaining a high velocity, such as tunas, sharks, and representatives of the family Xiphiidae (swordfish, marlin, sailfish). Body configurations for these fish and the influence of surface peculiarities on hydrodynamic resistance are discussed. The role of a mucous layer directly in contact with the water was investigated, in relation to friction. The chemical composition of mucous and eye fluid of tunas was also studied. K.P.D.

N72-24124# Joint Publications Research Service, Arlington, Va.
SOME ELECTRIC PROPERTIES OF A TURBOMAGNETIC VELOCITY SENSOR c14
B. G. Kaduk, N. A. Verevka, and G. M. Tatarenko *In its* Bionics 15 May 1972 p 193-198 refs (See N72-24117 15-05)
Avail: NTIS HC $12.75

A turbomagnetic velocity sensor for registering the velocity of objects in a fluid, especially in the field of hydrobionics, is discussed. Investigations reveal that such a sensor must be able to operate in the velocity range of 0.1 to 10 m/sec, with the period of velocity fluctuation not less than 0.3 to 0.5 sec. The sequence for processing electrical signals is considered for obtaining data on velocity, acceleration, and lung ventilation volume when measuring the parameters of respiration. The electrical and magnetic properties for a turbomagnetic sensor were also studied. K.P.D.

N72-24125# Joint Publications Research Service, Arlington, Va.
USE OF AN ELECTROLYTIC MICRO-CURRENT METER FOR MEASURING THE VELOCITY OF MOVEMENT c14
B. M. Yegidis and V. M. Shakalo *In its* Bionics 15 May 1972 p 199-204 refs (See N72-24117 15-05)
Avail: NTIS HC $12.75

The operation of an electrolytic microcurrent meter in sea water is considered and its electrical properties are discussed. The meter was used to measure the speed of dolphins. K.P.D

N72-24126# Joint Publications Research Service, Arlington, Va.
CYBERNETICS AND COMPUTER TECHNOLOGY
9 May 1972 69 p refs Transl. into ENGLISH from Kibernetika Vychislitelnaya Tekhn. (Kiev), no. 7, 1970 p 6-58 (JPRS-55937) Avail: NTIS HC $5.50

Selected articles are presented dealing with problems in cybernetics and the approaches taken towards their solution by the use of modern computer technology. For individual titles, see N72-24127 through N72-24134.

N72-24127# Joint Publications Research Service, Arlington, Va.
SOME PROBLEMS IN NEUROBIONICS
S. Ya. Zaslavskiy, K. A. Ivanov-Muromskiy, and V. Yu. Meytus *Inits Cybernetics and Computer Technol.* 9 May 1972 p 1-13 refs (See N72-24126 15-05)
Avail: NTIS HC $5.50

Approaches to the problem of creating technical devices capable of behaving like the brain are considered. Two methods of solution are discussed and the procedures involved in each are outlined. Basically, the first method consists of the technical realization of certain characteristics of the nervous system in general and of the brain in particular; the second involves a description of the processes going on in the brain on the information level. Various investigations conducted by researchers in the field are summarized to illustrate the relationship of these individual approaches to the two general methods discussed. D.L.G.

N72-24128# Joint Publications Research Service, Arlington, Va.
HEURISTIC MODELS IN SOCIOLOGY c34
N. M. Amosov and D. N. Galenko *In its* Cybernetics and Computer Technol. 9 May 1972 p 14-25 refs (See N72-24126 15-05)
Avail: NTIS HC $5.50

A possible means is analyzed of solving problems connected with the confirmation of proposed hypotheses in the specific activity of social control. This involves the construction of an operating model of the social system based on available information concerning the operation of society, and knowledge of the interaction of the elements of social subsystems. The language for such a model and the approach to the modeling process are discussed. An idea for construction of the model is proposed in which the structures of the Mentor and Sotsium models are combined. The proposal is based on the concept that the fundamental unit of the social system is the active behavioristic analog of man's social activity, a model of mankind in general. D.L.G.

N72-24129# Joint Publications Research Service, Arlington, Va.
PROBLEM OF MODELING PERCEPTION OF DISTANCE FROM VISIBLE BRIGHTNESS OF LANDMARKS
Ya. Ya. Belik *In its* Cybernetics and Computer Technol. 9 May 1972 p 26-31 refs (See N72-24126 15-05)
Avail: NTIS HC $5.50

The construction is considered of mathematical models for perception of distance by operators of moving man-machine systems. The proposed models are based on the visible brightness of landmarks and take into account two specific types of landmarks; reflectors and radiators. The first type includes all landmarks from whose surfaces electromagnetic waves in the visible portion of the spectrum are reflected. The second type radiate electromagnetic waves and become natural landmarks for

the operator when the surface flux of visible light radiation exceeds some threshold value. The derivation of equations used in the models is shown and a connection is established between the visible brightness of plane landmarks and observation conditions. D.L.G.

N72-24130# Joint Publications Research Service, Arlington, Va.
EXPERIMENTS IN CLASSIFICATION AND FORMATION OF CONCEPTS
V. P. Gladun, Ye. P. Popuriy, and Z. L. Rabinovich *In its* Cybernetics and Computer Technol. 9 May 1972 p 32-37 refs (See N72-24126 15-05)
Avail: NTIS HC $5.50

Experiments in the classification and formation of concepts were conducted in connection with the construction of a model of the brain as a learning system. The model is a programmed, growing network of neuron-like elements realizing reception, processing, and memorization of signals arriving from the outside medium, and the control of activity determined in the outside medium. The classification and formation of concepts were chosen, from among a number of similar problems, for clarifying the possibilities of the developed model. Author

N72-24131# Joint Publications Research Service, Arlington, Va.
INVESTIGATING THE LANGUAGE AND INTELLECT OF DOLPHINS c04
I. M. Kreyn *In its* Cybernetics and Computer Technol. 9 May 1972 p 38-44 refs (See N72-24126 15-05)
Avail: NTIS HC $5.50

The results of various research projects are reviewed concerning the complex structure and size of the dolphin brain. The question is considered as to whether it is possible to communicate with the dolphin, using as a basis information obtained on its collective capacity for mutual assistance, its alertness, learning capacity, and its tendency to associate with man. Particular emphasis is placed on experimental observations regarding the differences in the whistling of a single animal, the number of whistles per minute, their intensity, the continuity of one whistle, and sudden interruptions in whistling. After analyzing the results of experiments conducted on the subject it is concluded that the findings are subject to differences in interpretation and have not produced any significant results. However, a few of the approaches taken appear to hold out some promise for the eventual solution of the problem and are suggested as the direction in which future research should take. D.L.G.

N72-24132# Joint Publications Research Service, Arlington, Va.
STRUCTURE AND MODELING OF ROBOTS
V. Yu. Meytus *In its* Cybernetics and Computer Technol. 9 May 1972 p 45-57 refs (See N72-24126 15-05)
Avail: NTIS HC $5.50

The design is considered of devices that might successfully compete with man in the solution of intellectual problems. The approach taken is one of designing the individual elements of the integrated system and then attempting to combine these elements into a finalized system called a robot. Initial consideration is given to the various levels of the robot's description which include: algorithmic, the level of structural systems, the level of the principles on which individual stages of behavior are based, and the level of a combination of the specified structure of the robot and the formalized principles of behavior. Fundamental problems involved in attempts to approximate a mathematical system to real technical conditions are examined. A structural block scheme is developed for representation of the robot. Improving the accuracy of this scheme and describing its blocks in the form of algorithms are proposed as the means of obtaining a mathematical model of the robot and the eventual realization of a technical model. D.L.G.

N72-24133# Joint Publications Research Service, Arlington, Va.
A METHOD FOR CONTROLLING THE HUMAN OPERATOR
A. S. Osenniy and V. D. Romanov *In its* Cybernetics and Computer Technol. 9 May 1972 p 58-62 refs (See N72-24126 15-05)
Avail: NTIS HC $5.50

Electrophysiological indices are considered as a means of controlling the activity of the many structures in the human organism. A method is proposed for current statistical analysis of EEG from the numerical characteristics of the energy spectrum. The method permits the detection of fine changes in the spectral makeup of the EEG and is based on the possibility of describing every distribution of its moments. A system was developed for automatically measuring estimates of the energy spectrum numerical characteristics. The system consists of an analog computer for transformation of the analyzed process and a digital recording device for measuring and recording the data. Experimental results are presented which were obtained in using the method to detect EEG reactions of the effects of weak specific and nonspecific stimuli on the human operator. D.L.G.

N72-24134# Joint Publications Research Service, Arlington, Va.
ADAPTIVE HUMAN OPERATOR MODEL IN ONE PURSUIT TRACKING PROBLEM
V. A. Yakubovich and A. V. Timofeyev *In its* Cybernetics and Computer Technol. 9 May 1972 p 63-66 refs (See N72-24126 15-05)
Avail: NTIS HC $5.50

A mathematical description is developed for the operation of an adaptive system which models the activity of the human operator in a pursuit tracking situation. The approach taken is one in which the human operator is considered to be a system consisting of input sensors (visual), an adaptive regulator (brain), and an executing instrument (muscles of the hand). The mathematical description is accomplished by determining the transfer functions involved and deriving the necessary equations to synthesize the human operator model. The formulation of these equations is shown and includes specifications of a sensor equation, a motor equation, and an equation of motion for the target. D.L.G.

N72-24135# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
A COMPARISON OF PILOT DESCRIBING FUNCTION MEASUREMENT TECHNIQUES
C. E. Frostell Oct. 1971 60 p refs
(UTIAS-TN-167) Avail: NTIS HC $5.00

The techniques used to calculate human pilot describing functions are assessed. The study considers data analysis methods based on: (1) cross power spectral density of pilot input, output and error; (2) cross power spectral density of pilot output and error; (3) Fourier transform of pilot output and error. Taped records of human pilot performance from previous investigations in a compensatory control task with random input signals of continuous power spectra were on hand and provided a pilot data base. The same data were used to exercise each method, permitting direct comparison of the results. Data are presented as amplitude and phase plots of measured describing functions using an average of a reasonably large amount of data as well as single experimental runs. Author

N72-24136# Mauch Labs., Inc., Dayton, Ohio.
EXPERIMENTAL SPACE WORKER'S GARMENT AND HELMET ASSEMBLY
A. L. Marcum and H. A. Mauch Wright-Patterson AFB, Ohio AMRL Mar. 1972 23 p refs
(Contract AF 33(657)-8095; AF Proj. 6301)
(AD-738088; AMRL-TDR-64-37-Rev) Avail: NTIS CSCL 06/17

A new technique for pressurization and thermal control in a space worker's garment has been investigated. The goal was to design and fabricate complete coveralls and helmet that would consider the space environment and achieve physiological protection with exceptional reliability and a minimum of complementary systems. The coveralls utilize mechanical counterpressure applied by an integument of closed cell material

confined within a restraining garment. Thermal equilibrium is to be achieved by allowing natural physiological processes to control the evaporation of perspiration into the vacuum of space. Author (GRA)

N72-24137# Naval Training Device Center, Orlando, Fla.
PROCEEDINGS OF THE 5TH NAVAL TRAINING DEVICE CENTER AND INDUSTRY CONFERENCE
17 Feb. 1972 332 p refs Conf. held at Orlando, Fla., 15-17 Feb. 1972
(AD-737226; NAVTRADEVCEN-IH-206) Avail: NTIS CSCL 05/9

The report consists of a compilation of papers on a variety of technical and training subjects relating to training device technology and training methodology. These papers were presented at the Fifth Naval Training Device Center and Industry Conference held at the Contemporary Hotel, Walt Disney World, Orlando, Florida, February 15-17, 1972. The conference theme 'Twenty-five Years of Training Simulation--Springboard for the Future,' provided a common ground for the exchange of new ideas and discussion of mutual problems. This fifth conference is part of a continuing program to encourage and develop better liaison between the Naval Training Device Center and the training simulation industry. Author (GRA)

N72-24138# Naval Underwater Systems Center, Newport, R.I.
PATTERN RECOGNITION: PERCEPTION OF BINARY SEQUENCES
Jerry C. Lamb, K. E. Williams, and K. Kaufman 20 Dec. 1971 17 p refs
(AD-737201; NUSC-4231) Avail: NTIS CSCL 05/10

The experiment described in this report investigates the structure of binary sequences, their effect on pattern perception, and the effect of the number of stimuli in the pattern. Binary sequences (X's and O's) of lengths 6, 8, and 10 were presented tachistoscopically to subjects, who were required to reproduce the stimulus. The results indicate that the recall performance is directly related to the number of runs in the stimulus. The patterns of recall suggest a two-stage scanning process. Author (GRA)

N72-24139# Westinghouse Electric Corp., Pittsburgh, Pa.
THERMOELECTRIC HEATING AND VENTILATING SYSTEM Final Report, Oct. 1969 - Aug. 1971
A. M. Bernard Nov. 1971 35 p ref
(Contract DAAG17-70-C-0044; DA Proj. 1J0-62110-AJ-33)
(AD-737720; USA-NLABS-TR-72-26-CE) Avail: NTIS CSCL 06/17

Modifications and improvements incorporated into a thermoelectric heating and ventilating system are described. The thermoelectric heating and ventilating system is designed to provide a flow of temperature regulated air for use in heating or ventilating a specially designed military clothing ensemble. The system weighs ten pounds unfueled and required 0.26 pounds of fuel for each hour of operation. Eighteen c.f.m. of air S.T.P. conditions at four inches water column pressure is delivered for use in keeping an individual in thermal balance when operating in extreme environments (-40F to +110F) or when exposed to hazards. The electrical power required to obtain the flow of air is supplied by a thermoelectric generator which converts thermal energy directly into electrical energy. The thermal energy is derived from the combustion of liquid military fuels; leaded gasoline, kerosene, JP-4 and diesel fuels. Author (GRA)

N72-24140# Boeing Co., Seattle, Wash. Aerospace Group.
TARGET BACKGROUND SCALING AND ITS IMPACT ON THE PREDICTION OF AIRCREW TARGET ACQUISITION PERFORMANCE Final Report, 1 Jan. - 31 Oct. 1971
Lawrence P. Zaitzeff Dec. 1971 118 p refs
(Contract N00014-71-C-0194; NR Proj. 196-099)
(AD-737693; D180-14156-1) Avail: NTIS CSCL 17/8

The purpose of this study was to establish a preliminary target-background metric to be used in the prediction of dynamic visual aircrew target acquisition performance. This was accomplished by relating 14 physical and psychophysical characteristics of ten operational target-background encounters to observed air-to-ground cumulative target acquisition probability. The target acquisition performance on these targets had been previously validated by large-scale field tests conducted by Joint Task Force Two (JTF-2). Author (GRA)

N72-24141# Civil Aeromedical Inst., Oklahoma City, Okla.
DISCRIMINATION OF SHORT-DURATION (TWO PULSE) FLASHES AS A FUNCTION OF SIGNAL LUMINANCE AND METHOD OF MEASUREMENT
Henry W. Mertens and Mark F. Lewis Nov. 1971 8 p refs Sponsored by FAA
(AD-737872; FAA-AM-71-42) Avail: NTIS CSCL 05/5

The recent introduction of strobe lights for anticollision purposes raises the possibility of using temporal patterns of short duration flashes as information carrying signals. The current experiments are concerned with the detection of the minimum duration dark interval between signal light pulses as a function of signal luminance and the psychophysical method of measurement. Experiment I tested the theory of signal detectability (TSD) prediction that observer sensitivity is independent of the psychophysical method used in measurement. Discrimination of a constant duration stimulus (three msec) and a variable duration test stimulus (seven to 32 msec) was measured with a two-alternative Forced-Choice (FC) procedure and a Yes-No procedure. Sensitivity was comparable under the two psychophysical procedures, thus supporting the application of TSD to the sensory processes involved in discrimination of two-pulse stimuli. Experiment II measured discrimination with the FC procedure at three luminance levels: 31.8, 318, and 3183 candelas per square meter. Discriminability increased with luminance. Thus, pulses separated by a dark interval short enough so that only a single flash is seen over the entire scotopic intensity range may, however, be seen at photopic intensities as two pulses, or appear to flicker, or otherwise appear to be of different character. Author (GRA)

N72-24142# Bunker-Ramo Corp., Westlake Village, Calif.
DEVELOPMENT OF A HUMAN PERFORMANCE RELIABILITY DATA SYSTEM: PHASE 1 Final Report
David Meister and Robert G. Mills (AMRL) Wright-Patterson AFB, Ohio AMRL Dec. 1971 163 p refs
(Contract F33615-70-C-1518; AF Proj. 7134)
(AD-738322; AMRL-TR-71-87) Avail: NTIS CSCL 05/10

The human performance reliability (HPR) data system developed consists of assumptions, goals and definitions, a structure for classifying data elements, procedures for developing a data bank, and procedures for retrieving HPR data from that bank. The heart of the HPR system is a taxonomic structure for classifying both general behavioral and man-machine specific studies. Studies are classified in terms of the behavioral function performed, the stimuli presented and the equipment used to respond, environmental, subject and task characteristics. The end product of the classification is a descriptor used to retrieve data. Data are retrieved by first encoding a question asked of the HPR system, i.e. by translating the question into descriptor categories. The system then operates on the basis of AND/OR logic to sort progressively through the various categories to achieve the closest possible match with the entry descriptor. Thus, the precise answer to the question asked can be retrieved, assuming that the data bank contains appropriate data. Author (GRA)

06 CHEMISTRY

Includes chemical analysis and identification (e.g., spectroscopy). For applications see: 17 Materials, Metallic; 18 Materials, Nonmetallic; and 27 Propellants.

N72-24143*# Oak Ridge National Lab., Tenn.
NUCLEAR CHEMISTRY OF RETURNED LUNAR SAMPLES: NUCLIDE ANALYSIS BY GAMMA-RAY SPECTROMETRY Annual Report, period ending 31 Jan. 1972
G. Davis Kelley and James S. Eldridge 31 Jan. 1972 47 p refs
(NASA Order T-2400A; NASA-IA-40-123-67)
(NASA-CR-115552) Avail: NTIS HC $4.50 CSCL 07D

Concentrations of primordial radioelements and of cosmogenic radionuclides in crystalline rocks, breccias, and soils from the Ocean of Storms were determined. Concentrations of K, Th, U, Al-26, and Na-22 were determined for seven clastic or brecciated rocks, three sieved samples of fines, and one composite sample of sawdust from the cutting of a fragmental rock, all from samples obtained on the Apollo 14 mission. The K, Th, and U concentrations and cogmogenic radionuclide abundances in rocks and soils from Apollo 15 are also discussed. K.P.D.

N72-24144# Technische Hogeschool, Delft (Netherlands).
CRYSTALLINITY IN ATACTIC POLYVINYL CHLORIDE Ph.D. Thesis
Johannes Anthonij Juijn 5 Jan. 1972 113 p refs
Avail: NTIS HC $7.75

The crystalline phenomena in polyvinyl chloride is dealt with. Melting effects in both rigid and plasticized PVC were studied experimentally and by differential scanning calorimetry. Theoretical investigations on the structure of the chain molecular packing in crystallites were performed in order to explain the occurrence of crystallinity in atactic PVC. Author

N72-24145# Joint Publications Research Service, Arlington, Va.
ULTRASONIC SPECTROSCOPY OF LIQUIDS
L. G. Belinskaya and L. G. Peshchanskaya 8 May 1972 20 p refs Transl. into ENGLISH from Izv. Timiryazev. Selskokhoz. Akad. (Moscow), no. 1, 1972 p 193-200
(JPRS-55919) Avail: NTIS HC $3.00

A general theory, based on ultrasonic spectroscopy, is developed to determine the propagation and absorption of sound waves in liquids. Also determined are the transfer mechanism of acoustic energy by molecules of matter, the thermodynamics and kinetic parameters of the media, the intra- and inter-molecular processes, and the kinetics of irreversible processes occurring in the media. E.H.W.

N72-24146# National Defense Research Organization TNO, Rijswijk (Netherlands). Chemistry Lab.
LITHIUM HYDROXIDE FOR THE REMOVAL OF CARBON DIOXIDE: A LITERATURE SURVEY
R. H. Barents Jul. 1971 27 p refs In DUTCH; ENGLISH summary
(CL-1971-15; TDCK-58409) Avail: NTIS HC $3.50

LiOH, Li2O, and combinations of LiOH with oxides of other alkali metals were found to absorb CO2. The conditions that govern the removal of CO2 from gases are given. The relative humidity plays a role in the removal of CO2 by LiOH. Author

N72-24147# National Defense Research Organization TNO, Rijswijk (Netherlands).
NONDESTRUCTIVE TEST FOR CHARCOAL FILTERS. 1: THE PULSE TECHNIQUE AS A NONDESTRUCTIVE METHOD TO DETERMINE THE RESIDUAL GAS LIFE OF CHARCOAL ADSORBENTS
L. J. M. Bollen and H. W. VanderKlooster 1972 24 p refs
(CL-1972-9; TDCK-59631) Avail: NTIS HC $3.25

A nondestructive method was studied for the determination of the residual gas life of charcoal adsorbents, by the shape changes of the eluted peak of a weakly adsorbed gas, such as carbon dioxide or ethane. At high relative humidities and high water contents of the charcoal, no unique relationship was found between the residual gas life and height or width of the eluted peak. The method is well suited to determine the presence of leaks in the charcoal bed. Author

N72-24148# Iowa State Univ. of Science and Technology, Ames.
CERAMIC ENGINEERING, CHEMICAL ENGINEERING, CHEMISTRY, MATHEMATICS AND COMPUTER SCIENCE, METALLURGY, PHYSICS, AND REACTOR DIVISIONS Annual Summary Research Report, Jul. 1970 - Jun. 1971
Dec. 1971 312 p refs
(Contract W-7405-eng-82)
(IS-2600) Avail: NTIS

Research is reported on the following topics: (1) nuclear, structural, and inorganic chemistry; (2) radiation, isotope, and physical chemistry; (3) extraction chemistry; (4) liquid metals; (5) preparation and characterization of single crystals; (6) thermodynamic properties of ceramic materials; (7) diffusion and oxidation in ceramics; (8) systems and materials chemistry (metals); (9) diffusion, transport properties, and structure of metals; and (10) high energy, nuclear, and crystal physics. K.P.D.

N72-24149# Battelle Memorial Inst., Columbus, Ohio.
INVESTIGATION OF THERMALLY GROWN SiO2 BY ION MICROANALYSIS Final Report, 1 Jan. - 31 Dec. 1971
Ronald D. Baxter Dec. 1971 62 p refs
(Contract N00019-71-C-0084)
(AD-738060) Avail: NTIS CSCL 07/4

Thermally, grown SiO2 layers on Si have been investigated by the technique of ion microanalysis. Results are presented which demonstrate the presence of high concentrations of electrically inactive and immobile species of Na and K in as-grown oxides. The immobile impurities are confined to an SiO2 Si interfacial or transitional region about 200 A wide. Results are also presented which distinguish a separate, highly mobile species of Na which is readily introduced into the oxides by subsequent processing. It is further shown that the excess Na can redistribute and penetrate into the Si substrate at 600 C. Evidence for the high mobility of Na ions introduced by ion implantation is also presented. Results are presented which demonstrate the existence of a damaged region in SiO2 layers containing implanted impurities. Author (GRA)

N72-24150# California Univ., Santa Barbara. Dept. of Physics.
SPECTROSCOPY OF SELECTED DIATOMIC METAL AND METAL-OXIDE MOLECULES USING LASER EXCITED FLUORESCENCE Ph.D. Thesis
Stanley Ernest Johnson Dec. 1971 173 p refs Sponsored in part by NSF
(Grant AF-AFOSR-1851-70; AF Proj. 9750-02)
(AD-737753; AFOSR-72-0481TR) Avail: NTIS CSCL 07/4

A laboratory system has been developed for the gas phase production of diatomic metal-oxides, and a program has been initiated for the spectroscopic study of these molecules using the techniques of laser excited fluorescence. Metal-oxides were produced from the following metals: Al, Ba, Be, Mg, Fe, Pb, and Sn. These molecules were produced chemically in a flowing gas system by mixing metal vapor with an oxidant. Chemiluminescence invariably accompanied the formation of metal-oxides in this system. Laser excited fluorescence was shown to be useful for determining molecular constants, studying collisional processes, and for measuring radiative lifetimes and quenching cross sections. Author (GRA)

N72-24151# Air Force Rocket Propulsion Lab., Edwards AFB, Calif.
HIGH-ENERGY STORAGE INVESTIGATIONS Final Report, Dec. 1965 - Aug. 1968
Lawrence P. Quinn, H. Grady McMath, and David M. Mann Oct. 1971 73 p refs
(AF Proj. 3148)
(AD-737785; AFRPL-TR-71-36) Avail: NTIS CSCL 07/4

The reported storage of large amounts of energy in hydrocarbon materials exposed to a helium glow discharge has been investigated by means of an apparatus which provided significantly increased parameter control over previous designs. A

statistical study was made of the products of 28 experiments carried out under conditions identical to those which had earlier produced a sample with a measured heat of combustion of 31 Kcal and an implied energy storage of approximately 20 Kcal. This analysis revealed that the distribution of the heats of combustion of the products was normal, indicating that there had been no unusual energy storage. Author (GRA)

N72-24152# Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
EXPERIMENTAL STUDIES OF PHOTOIONIZATION PROCESSES IN AIR Semiannual Technical Report, 1 May - 1 Nov. 1971
Walter H. Wurster Feb. 1972 30 p refs
(Contract N00014-71-C-0387; ARPA Order 1479)
(AD-737733; CAL-AI-3107-A-1) Avail: NTIS CSCL 07/4

An experimental study is described whose objective is to assess the role of NO in the nonequilibrium vacuum ultraviolet (VUV) radiation from shock-heated air. The experiment utilizes a splitter-plate shock tube technique wherein the VUV radiation behind a reflected shock is used as a light source to measure the absorption by gases processed only by the incident shock wave. In addition, nonequilibrium radiation profiles behind strong incident shock waves are also measured to aid in the identification of the relevant excitation processes. The report describes the apparatus and presents the results of calculations needed to establish testing parameters. Author (GRA)

N72-24153# American Univ., Washington, D.C.
RESEARCH ON ELECTROCHEMICAL ENERGY CONVERSION SYSTEM Interim Technical Report, Nov. 1970 - May 1971
Robert T. Foley, Daryl H. Bomkamp, and Charles D. Thompson Oct. 1971 75 p refs
(Contract DA-44-009-AMC-1386(T); DA Proj. 1T0-61102-A-34A)
(AD-737703; ITR-11) Avail: NTIS CSCL 07/4

The technical work concerns two areas of research on electrochemical conversion systems. Cathode materials such as organic depolarizers of the Benzofuroxan structure are studied. The mechanism for the electro-reduction of benzofuroxan in aqueous solutions was clarified. Improved methods of treating electrode kinetic data were developed. Specifically, attention was devoted to methods of calculating values for the exchange current and transfer coefficients for reactions that are combined charge transfer and concentration controlled. Author (GRA)

N72-24154# Tyco Labs., Inc., Waltham, Mass.
CATALYSIS OF HYDROCARBON OXIDATION WITH ADSORBED LAYERS Semiannual Report
S. B. Brummer, M. J. Turner, and S. D. Kirkland Dec. 1971 56 p refs
(Contract DAAK02-71-C-0117)
(AD-738181; C-108-2; SAR-2) Avail: NTIS CSCL 07/4

The research is concerned with the development of the propane-oxygen fuel cell. The oxidation of C3H8 at Pt electrodes in H3PO4 containing Ni(2-) was studied further using both half-cells and complete fuel cells at 130C. Possible reasons for the differences in observed effects between the various electrode structures are discussed. Author (GRA)

N72-24155# Army Coating and Chemical Lab., Aberdeen Proving Ground, Md.
ESTIMATION OF CARBOXYLIC ACIDS IN SYNTHETIC POLYMERS BY TRANSESTERIFICATION AND GAS-LIQUID CHROMATOGRAPHY Final Report
George G. Esposito Feb. 1972 22 p refs
(DA Proj. 1T0-62105-A-329)
(AD-738142; CCL-302) Avail: NTIS CSCL 07/4

Synthetic polymers, such as alkyd and polyester resins, are incorporated as binders in protective coatings used for the maintenance of military equipment, and the type and amount of resin requisite for effective performance of formulated coatings are specified in military specifications governing the procurement of paint. The report describes a chromatographic procedure for the estimation of dicarboxylic acids and aromatic monocarboxylic acids in alkyd and polyester resins. The acids are converted to their butyl esters which are formed by refluxing a resin sample with butyl alcohol - boron trifluoride reagent. Gas-liquid chromatography is used for the separation of individual butyl esters, and chromatograms from the chromatographic analysis are used for the identification and estimation of carboxylic acids. Author (GRA)

N72-24122# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF SUPRAMOLECULAR STRUCTURES OF WATER-SOLUBLE POLYMERS AND THEIR ADSORPTION ACTIVITY
K. F. Lyashev and I. A. Dumanskiy *In its* Bionics 15 May 1972 p 152-156 refs (See N72-24117 15-05)
Avail: NTIS HC $12.75

07 COMMUNICATIONS

Includes communications equipment and techniques; noise; radio and communications blackout; modulation telemetry; tracking radar and optical observation; and wave propagation. For basic research see: 23 Physics, General; and 21 Navigation.

N72-24156 Stanxord Univ., Calif.
OPTIMIZATION IN THE DESIGN OF A MASS-PRODUCIBLE MICROWAVE RECEIVER SUITABLE FOR DIRECT RECEPTION FROM SATELLITES Ph.D. Thesis
James Martin Janky 1971 151 p
Avail: Univ. Microfilms Order No. 71-23520

Decision analysis and optimization was applied to the design of a mass-producible microwave adaptor which is capable of detecting wideband FM television signals broadcast from a synchronous satellite. A complete communications system design at 2.62 GHz is included. The methods of mathematical optimization are blended with engineering experience in this discrete, nonlinear design problem. Performance criteria are formulated and a hierarchy of decision variables is established. The appropriate alternatives for each receiver subsystem are evaluated. A prototype working model was fabricated and performs according to specifications. A cost estimate is made for production quantities ranging from 10 to 100,000 units. The cost for the receiver at the 100,000 unit level is $60 each. The design details of the prototype working model are included. Dissert. Abstr.

N72-24157 British Broadcasting Corp., Kingswood (England). Research Dept.
DIGITAL MAGNETIC RECORDING: CONVENTIONAL SATURATION TECHNIQUES
1972 11 p refs
(BBC-1972/9) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

Factors limiting packing density are emphasized, and results obtained during an initial experimental investigation are quoted. Possible coding and signal processing techniques are also described. Author

N72-24158 British Broadcasting Corp., Kingswood (England). Engineering Div.
SATELLITE BROADCASTING: A ZONED REFLECTOR AERIAL FOR THE DOMESTIC RECEPTION OF BAND 6
L. K. Bradley and R. W. King Apr. 1972 11 p refs
(BBC-1972/10) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

The design and measured performance of a new type of

aerial which might be suitable for the domestic reception of band 6 signals from a geostationary satellite are described. It is believed that in sufficient quantity it could be manufactured fairly cheaply. Author

N72-24159 British Broadcasting Corp., Kingswood (England). Engineering Div.

HF RADIO LINKS: THE FEASIBILITY OF AN AUTOMATIC EQUALISER FOR CORRECTING AMPLITUDE/FREQUENCY RESPONSE DISTORTION

N. H. C. Gilchrist May 1972 10 p refs

(BBC-1972/11) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

The fading which occurs on long distance HF broadcast links frequently causes distortion of the amplitude/frequency response to the modulating signal. A type of equalizer is described for providing continuous correction of the audio response, involving the use of a number of pilot tones which are added to the program before transmission. The test results of a model showed the inadequacy of applying correction in four audio bands, when dealing with a typical HF path. Author

N72-24160*# Massachusetts Inst. of Tech., Cambridge. Center for Space Research.

HALF WAVELENGTH DIPOLE ANTENNAS OVER STRATIFIED MEDIA

Gerald A. LaTorraca Feb. 1972 164 p refs

(Contract NAS9-11540)

(NASA-CR-115561; CSR-T-72-1) Avail: NTIS HC $10.25 CSCL 17B

Theoretical solutions of the fields induced by half-wavelength, horizontal, electric field dipoles (HEDS) are determined based on studies of infinitesimal, horizontal, electric field dipoles over low loss plane-stratified media. To determine these solutions, an approximation to the current distribution of a half-wavelength HED is derived and experimentally verified. Traverse and antenna measurements obtained on the Athabasca Glacier in the summer of 1971 are related to the characteristics of the transmitting antenna design, and the measurement techniques and field equipment used in the glacier trials are described and evaluated. Author

N72-24161*# Automated Marine International, Newport Beach, Calif.

INVESTIGATION OF L-BAND SHIPBOARD ANTENNAS FOR MARITIME SATELLITE APPLICATIONS Final Report

G. P. Heckert 2 Feb. 1972 453 p refs

(Contract NASw-2165)

(NASA-CR-126030) Avail: NTIS HC $24.75 CSCL 09E

A basic conceptual investigation of low cost L-band antenna subsystems for shipboard use was conducted by identifying the various pertinent design trade-offs and related performance characteristics peculiar to the civilian maritime application, and by comparing alternate approaches for their simplicity and general suitability. The study was not directed at a single specific proposal, but was intended to be parametric in nature. Antenna system concepts were to be investigated for a range of gain of 3 to 18 dB, with a value of about 10 dB considered as a baseline reference. As the primary source of potential complexity in shipboard antennas, which have beamwidths less than hemispherical as the beam pointing or selecting mechanism, major emphasis was directed at this aspect. Three categories of antenna system concepts were identified: (1) mechanically pointed, single-beam antennas; (2) fixed antennas with switched-beams; and (3) electronically-steered phased arrays. It is recommended that an L-band short backfire antenna subsystem, including a two-axis motor driven gimbal mount, and necessary single channel monopulse tracking receiver portions be developed for demonstration of performance and subsystem simplicity. Author

N72-24162# National Environmental Satellite Center, Washington, D.C.

CHROMIUM DIOXIDE RECORDING: ITS CHARACTERISTICS AND POTENTIAL FOR TELEMETRY

Florence Nesh Mar. 1972 14 p refs

(NOAA-TM-NESS-34) Avail: NTIS HC $3.00

The kinetics of the magnetic recording reaction was studied. An expression was derived for an equilibrium constant calculation which holds for all conditions of tape concentration, signal field, and bias field. A preliminary study was made of the rate processes involved in this reaction, and an attempt to apply the rate equations to the experimental results was undertaken. Gamma-ferric oxide and chromium dioxide tapes were studied and compared. Author

N72-24163# National Defense Research Organization TNO, The Hague (Netherlands). Physics Lab.

SOME REMARKS ON RADAR WEATHER CLUTTER CANCELLATION

M. L. Toppinga Jul. 1971 40 p refs

(PHL-1971-31; TDCK-58313) Avail: NTIS HC $4.00

Possible adverse influences by precipitation on a coherent low sigma pulse radar of the inertially scanning and tracking type, using centimetric waves were studied. Under idealized filter assumption, the theory of clutter breakthrough into the receiving channel is developed. The idealized theory is based on the spectral properties of said precipitation and brings out clearly the limitation of precipitation clutter suppression. Data on rain and wind, valid for the Netherlands are given, together with general summarizing precipitation information. Author

N72-24164# National Defense Research Organization TNO, The Hague (Netherlands).

RADAR GROUND RETURNS. PART 1: THE RADAR BACKSCATTER OF VEGETATION

G. P. deLoor and A. A. Jurriens Jan. 1972 61 p refs

(PHL-1972-3; TDCK-59518) Avail: NTIS HC $5.25

To build up a clutter model for radar ground clutter and to study the possible use of image tone in SLAR imagery, a series of measurements was undertaken on radar ground returns. The radar backscatter coefficient of single vegetation types through a complete growing season is considered. A stable platform (television tower) with the radar at an altitude of 75 m (230 ft) above the terrain was used. The influence of the weather and the season on the backscatter coefficient was studied. Author

N72-24165*# Analytical Systems Corp., Burlington, Mass.

RADIO ASTRONOMY EXPLORER (RAE) 1 OBSERVATIONS OF TERRESTRIAL RADIO NOISE Final Report, 17 Mar. - 30 Sep. 1971

John R. Herman and Joseph A. Caruso 26 Oct. 1971 86 p refs

(Contract NAS5-11385)

(NASA-CR-122401; ASCR-72-54) Avail: NTIS HC $6.50 CSCL 17B

Radio Astronomy Explorer (RAE) 1 data are analyzed to establish characteristics of HF terrestrial radio noise at an altitude of about 6000 km. Time and frequency variations in amplitude of the observed noise well above cosmic noise background are explained on the basis of temporal and spatial variations in ionospheric critical frequency coupled with those in noise source distributions. It is shown that terrestrial noise regularly breaks through the ionosphere and reaches RAE with magnitudes 15 or more db higher than cosmic noise background. Maximum terrestrial noise is observed when RAE is over the dark side of the Earth in the neighborhood of equatorial continental land masses where thunderstorms occur most frequently. The observed noise level is 30-40 db lower with RAE over oceans. Author

N72-24166*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

END-TO-END RMS ERROR TESTING ON A CONSTANT

BANDWIDTH FM/FM SYSTEM
G. R. Wallace and W. E. Salter (Sperry Rand Corp.) 10 Mar. 1972 22 p
(NASA-TM-X-64647) Avail: NTIS HC $3.25 CSCL 17B

End-to-end root-mean-square (rms) tests performed on a constant bandwidth FM/FM system with various settings of system parameters are reported. The testing technique employed is that of sampling, digitizing, delaying, and comparing the analog input against the sampled and digitized corresponding output. Total system error is determined by fully loading all channels with band-limited noise and conducting end-to-end rms error tests on one channel. Tests are also conducted with and without a transmission link and plots of rms errors versus receiver signal-to-noise (S/N) values are obtained. The combined effects of intermodulation, adjacent channel crosstalk, and residual system noise are determined as well as the single channel distortion of the system. Author

N72-24167*# Magnavox Research Labs., Torrance, Calif.
OPERATIONAL MANUAL FOR MX-290 DATA-VOICE PN MOD, MX-291 DATA-VOICE PN DEMOD
11 Oct. 1971 159 p
(Contract NAS5-16955)
(NASA-CR-122416; MRL-R-4165) Avail: NTIS HC $10.00 CSCL 17B

This operation manual is also the final report of the program to design, assemble, checkout, and deliver to the customer three MX-290 transmitters and two MX-291 companion receivers. This equipment is designed and assembled to provide for maximum flexibility with respect to making changes in electrical circuits which may be required for future applications. A number of test points for monitoring and troubleshooting are provided along with easy access to subunits. Author

N72-24168# Joint Publications Research Service, Arlington, Va.
THROUGHPUT CAPACITY OF MULTIPATH CHANNELS
D. D. Klovskyy and V. A. Soyfer 9 May 1972 14 p refs Transl. into ENGLISH from Probl. Peredachi Inform. (Moscow), v. 8, no. 1, 1972 p 16-25
(JPRS-55939) Avail: NTIS HC $3.00

The throughput capacity of multipath channels is determined under slow fading conditions. The statistics of each of the N paths is described by a generalized Gaussian model. The throughput capacity is defined both under conditions of separate reception, and when separate reception is impossible. In the former case, two methods of beam combination are studied: noncoherent addition and synphasing. Author

N72-24169# Joint Publications Research Service, Washington, D.C.
ENGINEERING PSYCHOLOGY IN RADAR
G. P. Popov and V. I. Nikolayev, ed. 23 Mar. 1972 138 p refs Transl. into ENGLISH of the book "Inzhenernaya Psikhologiya v Radiolokatsii (Sistema Indikator-Operator)" Moscow, Sovetskoye Radio Publishing House, 1971 144 p
(JPRS-55522) Avail: NTIS HC $9.00

The application of engineering psychology data in the investigation and evaluation of circular-scanning radar sets (RLS) and of devices for representing information is considered. Special attention is devoted to the statistical analysis of signal detection by the RLS operator. A description of methods of calculating the characteristics of the detection of signals is given with consideration of the psychophysiological features of the operator, and methods of finding optimum forms of communication in the indicator-operator link are considered. Author

N72-24170# Joint Publications Research Service, Arlington, Va.
RECOMMENDED RADIO TERMS
A. L. Badalov, N. I. Chistyakov, and V. F. Pchelkin 10 May 1972 18 p Transl. into ENGLISH from Radiotekh. (Moscow), v. 27, no. 1, 1972 p 105-111
(JPRS-55957) Avail: NTIS HC $3.00

Approximately 188 radio terms are recommended for use in scientific and technical literature, education, standards, and in technical documents. The terminology is in the following four categories: (1) general principles, (2) radio frequency and wave classification, (3) radio systems, services, and stations, and (4) technical characteristics. Author

N72-24171*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
APOLLO EXPERIENCE REPORT: LUNAR MODULE LANDING RADAR AND RENDEZVOUS RADAR
Patrick Rozas and Allen R. Cunningham Washington Jun. 1972 23 p refs
(NASA-TN-D-6849; MSC-S-311) Avail: NTIS HC $3.00 CSCL 17I

A developmental history of the Apollo lunar module landing and rendezvous radar subsystems is presented. The Apollo radar subsystems are discussed from initial concept planning to flight configuration testing. The major radar subsystem accomplishments and problems are discussed. Author

N72-24172# Joint Publications Research Service, Arlington, Va.
THE PROBLEM OF COMPRESSION OF LITERAL MESSAGES
O. L. Smirnov and F. I. Yunakov 9 May 1972 3 p ref Transl. into ENGLISH from Probl. Peredachi Inform. (Moscow), v. 8, no. 1, 1972 p 99-100
(JPRS-55938) Avail: NTIS HC $3.00

The ordering of words in dictionary A alphabet q is considered to allow minimization of the mean length of the code for literal coding of the first r words and arbitrary coding of the remaining words. A method is suggested for solving the problem, related to running through all possible ordering versions. Author

N72-24173*# Texas Univ., Austin. Electrical Engineering Research Lab.
ATTENUATION STUDIES AT 35 GHz Progress Report, 1 Dec. 1971 - 30 Apr. 1972
Lai-iun Lo and Wolfhard Vogel 30 Apr. 1972 11 p
(Contract NAS5-10387)
(NASA-CR-122422) Avail: NTIS HC $3.00 CSCL 20N

Instrumentation and preliminary results of studies of attenuation of 35 GHz radio signals transmitted through the atmosphere are reported. The purpose of this work is to provide information to supplement the ATS-5 downlink tests. Data on atmospheric losses at 35 GHz are being obtained by sun tracker techniques, sky temperature observations, and point-to-point transmissions. Author

N72-24174# European Space Research Organization, Paris (France).
SPACECRAFT OPERATIONS. VOLUME 2: DATA ACQUISITION AND TRANSMISSION
May 1971 138 p refs Partly in ENGLISH and partly in FRENCH Proc. of the 8th ESRO Summer School, Neu-Isenburg, West Ger., 1970
(ESRO-SP-65) Avail: NTIS HC $9.00

Data acquisition methods and equipment in a satellite tracking ground station for phase modulated PCM telemetry reception are described. The receiving chain extends from the antenna to the output of the bit conditioner, the latter being the first part of a chain in which the data are subjected to a decision process, after which they are presented in reconstituted form for the equipment in the next chain. For volume 5, see N72-24896 For individual titles, see N72-24175 through N72-24181.

N72-24175# European Space Research and Technology Center, Noordwijk (Netherlands).
DATA ACQUISITION ON THE GROUND
W. G. King *In* ESRO Spacecraft Operations, Vol. 2 May 1971 p 1-3 (See N72-24174 15-07)

Avail: NTIS HC $9.00

The data acquisition and transmission procedures and equipment in the ESTRACK network, and the roles of ground stations and control center are discussed. Topics include ground station-satellite communication, data communication network problems noting the application of leased telephone lines, data compression and coding, and control center operations.

Author (ESRO)

N72-24176# European Space Operations Center, Darmstadt (West Germany).

BACKGROUND OF THE ESTRACK COMMUNICATIONS NETWORK c11

M. W. Haydock *In* ESRO Spacecraft Operations, Vol. 2 May 1971 p 35-38 (See N72-24174 15-07)

Avail: NTIS HC $9.00

The ESTRACK telecommunication network is described which enables information transmission between four telemetry, telecommand, tracking station, and the ESRO control center at Darmstadt. The transmission takes place over teleprinter and voice/data lines. Each station is reviewed. Author (ESRO)

N72-24177# European Space Operations Center, Darmstadt (West Germany).

TRANSMISSION OF SPACECRAFT DATA ON LEASED TELEPHONE LINES

Hans K. Uhrig *In* ESRO Spacecraft Operations, Vol. 2 May 1971 p 39-48 (See N72-24174 15-07)

Avail: NTIS HC $9.00

The transmission of satellite control data over leased telephone lines using modems in the ESTRACK network is discussed. The characteristics of telephone lines in relation to data transmission, such as attenuation and group delay, are described. The types of modems and the techniques of synchronous and asynchronous transmission are explained. The voice intercommunication system is also considered, based on a conference circuit used at the control center and between the center and the ground stations. Author (ESRO)

N72-24178# Consiglio Nazionale delle Ricerche, Florence (Italy). Ist. di Ricerca sulle Onde Elettromagnetiche.

COMPRESSION AND CODING SYSTEMS FOR DATA TRANSMISSIONS FROM THE GROUND STATIONS TO THE CONTROL CENTER

V. Cappellini *In* ESRO Spacecraft Operations, Vol. 2 May 1971 p 49-85 refs (See N72-24174 15-07)

Avail: NTIS HC $9.00

Possibilities of data compression and error correcting coding for data transmission from ground stations to control center are surveyed. Some systems for data compression with prediction, interpolation, digital filtering, Hadamard transformations, and parameter estimation are described. Digital filtering is discussed. For error correcting codes, the following types are described; optimum group codes, cyclic codes, BCH codes, orthogonal codes, and convolutional codes with threshold and with sequential decoding. Comparison criteria for the different types are considered. Special purpose and general purpose on-line processors are proposed for practical application of the techniques considered. Author (ESRO)

N72-24179# European Space Operations Center, Darmstadt (West Germany).

EQUIPMENT FOR THE NEW ESRO CONTROL CENTRE

M. W. Haydock *In* ESRO Spacecraft Operations, Vol. 2 May 1971 p 87-99 (See N72-24174 15-07)

Avail: NTIS HC $9.00

Parts of the equipment system for the ESRO control center concerned with real time PCM decommutation and display are described. The requirements placed upon the system by the input data from the TD-1 satellite are discussed. The following topics are briefly highlighted; automatic control of PCM equipment, the PCM/compuer interface, and the telemetry console.

Author (ESRO)

N72-24180# European Space Operations Center, Darmstadt (West Germany).

CONTROL CENTRE EQUIPMENT FOR SPACECRAFT CONTROL AND DATA PROCESSING c08

G. W. J. Drewes *In* ESRO Spacecraft Operations, Vol. 2 May 1971 p 101-108 (See N72-24174 15-07)

Avail: NTIS HC $9.00

The equipment required for satellite control and data processing at the European control center is described. Decommutation and display equipment for real time data processing are given in the form of block diagrams. The conversion of PCM telemetry tapes from the ground stations, including timing information, to computer compatible tapes, is mentioned. Author (ESRO)

N72-24181# European Space Operations Center, Darmstadt (West Germany).

OPERATIONAL PROCEDURES FOR PROCESSING OF MAGNETIC TAPES [PROCEDURES OPERATIONNELLES CONCERNANT LE TRAITEMENT DES BANDES MAGNETIQUES]

G. Labrune *In* ESRO Spacecraft Operations, Vol. 2 May 1971 p 109-133 In FRENCH (See N72-24174 15-07)

Avail: NTIS HC $9.00

The processing and evaluation procedures of satellite PCM telemetry tapes are described. The operations include decommutation, evaluation, and analog to digital conversion. The results of automation of procedures upon throughput is discussed. Author (ESRO)

N72-24182# Philco-Ford Corp., Willowgrove, Pa. Communications and Technical Services Div.

CIRCUIT QUALITY MONITOR Semiannual Report, 28 May - 24 Nov. 1971

William Foerster, Andrew T. Powshok, and C. S. Klayman Jan. 1972 36 p

(Contract DAAB07-71-C-0271; DA Proj. 1H6-63707-D-246) (AD-737764; ECOM-0271-1; SAR-1) Avail: NTIS CSCL 17/2

The report describes the technical progress in developing a Circuit Quality Monitor (CQM). The object of the CQM program is to establish the feasibility of automatically classifying high usage links as to their relative suitability for voice or data operation. The report outlines the system concept of the CQM with regard to its component parts and their function in achieving the desired link classification. Author (GRA)

N72-24183# Bell Aerospace Co., Buffalo, N.Y.

RESEARCH ON THE CLASSIFICATION OF STATISTICALLY AND GRAPHICALLY DEFINED PATTERNS Final Report

Lester A. Gerhardt and Kenneth W. Drake Feb. 1972 49 p refs

(Contract F44620-71-C-0041; AF Proj. 9769) (AD-737729; Rept-9500-920227; AFOSR-72-0482TR) Avail: NTIS CSCL 09/4

The first part of the report discusses extracting and classifying simple binary patterns in binary data streams which have been derived from analog signals. It is shown that, although the A/D and subsequent coding operations are inherently nonlinear, certain characteristics such as periodicities present in the original analog data are retained in the binary sequences. Superposition is not maintained through the conversion, for example. Clustering of binary representations of analog data do not usually cluster in the classification space so as to permit easy separation. The effect of quantizing noise and the inability to reconstruct the original analog data from the once quantized data streams presents additional problems. The second part of the report is concerned with automata theory and extends and generalizes the results of last year's work in this area. This year, a generalization of the binary pattern classes was considered. This generalization is based upon relaxation of the restrictions imposed upon the nature of the pattern sets. Author (GRA)

N72-24184# Stanford Research Inst., Menlo Park, Calif.
SUMMARY OF MEASUREMENTS AND MODELING OF THE RADIATION PATTERNS OF SIMPLE HF FIELD ANTENNAS IN OPEN (LEVEL) TERRAIN, MOUNTAINS, AND FORESTS Final Report
G. E. Barker, J. Taylor, and G. H. Hagn Dec. 1971 129 p refs
(Contract DAAB07-70-C-0220; ARPA Order 371; SRI Proj. 8663)
(AD-737724; STR-45) Avail: NTIS CSCL 09/5

Full-scale measurements of the radiation patterns of simple HF field-expedient antennas (dipoles, monopoles, inverted L's, and slant wires) were conducted while the antennas were situated over open (level) terrain, in a U.S. pine forest, in a tropical forest in Thailand, and (under another contract) in hilly terrain. The major results from these measurements are summarized and examples of the measured data are presented in the report. A computer model of a short dipole antenna in a homogeneous, isotropic forest medium was developed and the calculated results are compared with measured data from short and half-wave resonant dipoles. Author (GRA)

N72-24185# Florida Univ., Gainesville. Communication Sciences Lab.
ANNOTATED BIBLIOGRAPHY ON UNDERWATER COMMUNICATION
Patti Paul Hollien, Harry Hollien, Howard B. Rothman, and Stephen H. Feinstein 1 Dec. 1971 39 p refs
(Contract N00014-68-A-0173-0008)
(AD-737663; CSL/ONR-43) Avail: NTIS CSCL 17/2

The entire report is provided as a service to workers investigating or interested in diver communication. Toward this purpose it attempts to provide a reasonably complete list of annotated references in this area. Author (GRA)

N72-24186# Michigan State Univ., East Lansing. Div. of Engineering Research.
INVESTIGATION OF BACKFIRE ANTENNAS AND IMPEDANCE LOADED SLOT AND WIRE ANTENNAS Final Report, 1 Nov. 1969 - 31 Oct. 1971
Kun-Mu Chen Nov. 1971 17 p refs
(Contract F19628-70-C-0072; AF Proj. 5635)
(AD-737825; AFCRL-71-0580) Avail: NTIS CSCL 09/5

This is the final report under contract F19628-70-C-0072 and summarizes the research performed in the Department of Electrical Engineering and Systems Science, Michigan State University. Topics investigated were: (1) the radiation and circuit properties of backfire antennas and open-cavity radiators, (2) the characteristics of impedance loaded slot antennas, (3) the properties of a multi-loaded cylindrical antenna, and (4) the modification of scattering by a multi-loaded slotted cylinder. Author (GRA)

N72-24187# Naval Research Lab., Washington, D.C.
PERFORMANCE OF A PARABOLIC ANTENNA WITH AN OFFSET FEED Final Report
L. S. Wagner and Kenneth W. Morin Dec. 1971 52 p refs
(AD-737619; NRL-MR-2375) Avail: NTIS CSCL 09/5

Performance of a parabolic cylinder excited by an offset line-source has been investigated by digital computer techniques. Performance parameters monitored include gain, beamwidth and main-lobe-to-coma lobe ratio. Axial focusing has been incorporated in the calculation for purposes of maximizing antenna gain. Antenna patterns for cases of a uniformly illuminated aperture and for an aperture with a 10 dB cosine taper are presented for values of f/D ranging between 1.0 and 2.0 and for lateral feed displacements up to one fourth of the focal length. Author (GRA)

N72-24188# California Inst. of Tech., Pasadena. Antenna Lab.
ELECTROMAGNETIC WAVE PROPAGATION AND SOURCE RADIATION IN SPACE: TIME PERIODIC MEDIA
Charles Elachi Nov. 1971 96 p refs
(Grant AF-AFOSR-1935-70; AF Proj. 9768)
(AD-737517; AFOSR-72-0175TR; TR-61) Avail: NTIS CSCL 20/14

The electromagnetic wave equations for the fields, potentials, and Hertz vectors are derived and a Lorentz gauge is given for space-time dependent media. Electromagnetic wave propagation, electric and magnetic dipole radiation, and Cerenkov and transition radiation in sinusoidally space-time periodic dielectric, plasma, and uniaxial plasma are studied and numerous radiation patterns are given. Finally the study is extended to general space-time periodic media. Author (GRA)

N72-24189# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
REFRACTIVE QUALITIES OF THE STRATOSPHERIC LAYER EXPOSED TO CIRCULARLY POLARIZED RADIO WAVES IN THE 30-45 GIGAHERTZ BAND
V. A. Kinnievskii 4 Nov. 1971 9 p Transl. into ENGLISH from the publ. "Voprosy Rasprostraneniya Elektromagnitnykh Voln Vysokoy Chastoty. Sbornik Statey" Moscow, Nauka, 1970 p 76-80
(AD-738242; FTD-HT-23-1511-71) Avail: NTIS CSCL 20/14

The article reflects the state of the art and the latest Soviet scientific thinking on microwave tropospheric propagation for communications - related purposes. Transmission reliability and the most recent investigation of this area and equipment complexity and cost are also discussed. The polarized inversion layer between the troposphere and ionosphere and its effect on microwave transmission are also covered. The latest thinking with respect to antenna setup and configuration and power characteristics and cost also receive attention. Author (GRA)

N72-24190# Army Foreign Science and Technology Center, Charlottesville, Va.
METHOD OF MEASUREMENT OF LEVELS OF SIGNALS AND NOISE
S. I. Tropkin 19 Jan. 1972 12 p Transl. into ENGLISH from Avtomatika, Telemekhan. i Svyaz (Moscow), no. 7, 1970 p 7-10
(AD-737964; FSTC-HT-23-1550-71) Avail: NTIS CSCL 17/2

A method is described for measuring levels of signals and noise involving strip chart recording of signal and noise level and subsequent statistical processing of the recordings. The method is applicable to recording of noise in railroad communications systems. Author (GRA)

N72-24191# California Inst. of Tech., Pasadena. Antenna Lab.
ELECTROMAGNETIC FIELDS IN NONUNIFORM LOSSLESS TRANSMISSION LINES
Patrick A. McGovern Oct. 1971 146 p refs
(Grant AF-AFOSR-1935-70)
(AD-738317; TR-60; AFOSR-72-0198TR) Avail: NTIS CSCL 20/14

Methods are developed for electromagnetic field calculations in nonuniform lossless transmission lines which support quasi-one dimensional propagation of a single baseband wave species. Approximate solutions are obtained in perturbation series for smoothly tapered lines by expanding Maxwell's equations and boundary conditions in the dimensionless parameter eta, given by the ratio of typical cross-section dimension to the length of the tapered section. The method emphasizes construction of a single 'warped' field description rather than the local modal expansions of Schelkunoff's generalized telegraphist's equations. Author (GRA)

N72-24192# Stanford Research Inst., Menlo Park, Calif.
PATTERN MEASUREMENT AND MODELING OF FULL SCALE VHF ANTENNAS IN A THAILAND TROPICAL FOREST
G. E. Barker and W. A. Hall Dec. 1971 209 p refs
(Contract DAAB07-70-C-0220; ARPA Order 371)
(AD-738177; TR-39) Avail: NTIS CSCL 09/5

Measurements of the radiation patterns of full-scale simple VHF antennas (Half-wavelength dipoles) were performed while the antennas were situated in a second-growth tropical forest in Thailand. The data was processed statistically using a digital computer to provide contour plots of the median signal strength as a function of azimuth and elevation angle. In addition to the contour plots of the radiation patterns for the two polarizations, estimators of the standard deviations of the signal strength, and a comparison of the relative gains of the average signal strength at the measured pattern maxima are provided. Author (GRA)

N72-24193# Pennsylvania Univ., Philadelphia. Moore School of Electrical Engineering.

PENNSYLVANIA-PRINCETON ARMY AVIONICS RESEARCH PROGRAM. ARMY AIRCRAFT COMMUNICATION TASK Final Technical Report

Fred Haber Ft. Monmouth, N. J. ECOM Dec. 1971 181 p refs

(Contract DA-28-043-AMC-02411(E); DA Proj. 1H1-62202-A-219)

(AD-738178; Rept-72-13; ECOM-02411-26) Avail: NTIS CSCL 17/2

The objective was to pursue Army Aircraft requirements anticipated in the 1970-1980 time interval, including requirements for navigation, identification, and landing systems; the use of random access techniques; experiment on, and analysis of, the propagation environment of Army aircraft; and methods for reducing effects of fading resulting from strong specular reflections. Author (GRA)

N72-24194# Electronic Communications, Inc., St. Petersburg, Fla.

CIRCUIT QUALITY MONITOR Semiannual Report, 26 May - 26 Nov. 1971

William L Betts Feb. 1972 45 p refs

(Contract DAAB07-71-C-0272)

(AD-738182; ECI-1-AER-0025; ECOM-0272-1; SAR-1) Avail: NTIS CSCL 17/2

The purpose of the program is to design, develop, and fabricate two advanced development models of the circuit quality monitor. The monitor is a device which automatically measures and displays the quality of voice bandwidth channels in the U.S. Army tactical toll system. Twelve channels are measured on a non-interfering basis once every fifteen minutes. Three degrees of quality are continuously displayed: usable for data, usable for voice but not high speed data, and unusable. Quality is measured in terms of amplitude spectrum, group delay spectrum, frequency offset, and message circuit noise. Author (GRA)

N72-24195# Linkabit Corp., San Diego, Calif.

PERFORMANCE STUDY OF VITERBI DECODING AS RELATED TO SPACE COMMUNICATIONS

I. M. Jacobs and J. A. Heller 31 Aug. 1971 144 p refs

(Contract DAAB07-71-C-0148)

(AD-738213) Avail: NTIS CSCL 09/4

The following topics are discussed: Viterbi decoder performance; Viterbi decoder implementation and usage; Review of TDMA system aspects related to Viterbi decoding; Encoder and TDMA system configurations; Soft decisions for quadriphase modem; Decoder reliability predictions. GRA

N72-24196# Naval Research Lab., Washington, D.C.

SYNTHETIC APERTURE GENERATED BY A SEABORNE TARGET CROSSING A FIXED RADAR BEAM, SOME THEORETICAL CONSIDERATIONS Final Report

Alfred E. Long Jan. 1972 33 p refs

(AD-737992; NRL-MR-2387) Avail: NTIS CSCL 17/9

The report investigates theoretically the problem of synthetic aperture processing of the radar signature of a seaborne target crossing a fixed radar beam. Particular emphasis is placed upon accommodating the modulation from target roll. A two-dimensional target model is used to derive an ambiguity-type function relating combined resolution in height above roll axis and length along target. For sinusoidal roll the function may be calculated analytically. The number of roll periods in the coherent observation time and the roll phase are important in determining the ambiguity surface shape, particularly when the former is 1 or less. Calculated and computed examples of the surface show that it is spread out to such an extent that synthetic aperture processing does not yield a readily interpretable target image under most practical radar-target conditions. Author (GRA)

N72-24197# Northeastern Univ., Boston, Mass.

SIGNAL IMPROVEMENT STUDIES AND INSTRUMENTATION SYSTEMS FOR SPACE VEHICLES Final Report, 1 Apr. 1968 - 30 Sep. 1971

J. Spencer Rochefort, Lawrence J. OConnor, Norman C. Poirier, and Robert E. Russell 31 Oct. 1971 96 p refs

(Contract F19628-68-C-0197; AF Proj. 7659)

(AD-737840; AFCRL-71-0578) Avail: NTIS CSCL 09/6

Contract effort can be grouped under programs concerned with telemetry system studies, rocket and balloon instrumentation systems, orbiting vehicles, field support for certain sounding rockets and balloons, and evaluation of commercial telemetry system components. The telemetry system studies are concerned with signal-to-noise improvement in frequency division multiplex systems and deal with subcarrier pre-emphasis tapers, computer analysis of FM/FM spectrums and extension of system threshold. The orbital vehicle effort is concerned with the solar panels and a magnetic tape recorder for the Cannonball II satellite as well as the solar power analysis of an additional vehicle. The field support rendered in connection with the various programs is tabulated. Author (GRA)

N72-24198# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.

THE FOUR-ELEMENT SBF ARRAY: VARIATION OF PARAMETERS FOR OPTIMIZATION OF PERFORMANCE

Hermann W. Ehrenspeck and John A. Strom 12 Nov. 1971 52 p refs

(AD-738325; AFCRL-71-0569; AFCRL-PSRP-466) Avail: NTIS CSCL 09/5

Four-element short-backfire (SBF) arrays have been shown to yield maximum gains of approximately 20 dB. The influence of parameter variations on the array patterns has been experimentally determined. Specific parameter values required to yield certain pattern characteristics--for example, highest gain, lowest sidelobe level, equal half-power beamwidth, or equal beam shapes in both the E and H planes--have been established. Tables of the normalized design parameters are given for construction purposes. All array dimensions are indicated in wavelengths so that each model can easily be scaled for any desired frequency range. Author (GRA)

N72-24199# Massachusetts Inst. of Tech., Cambridge. Aerophysics Lab.

EFFECT OF AN ALLEVIATED PLASMA BOUNDARY LAYER ON THE TRANSMISSION OF HIGH POWER MICROWAVE SIGNALS Final Scientific Report, 1 Nov. 1970 - 31 Oct. 1971

Charles W. Haldeman and D. Graham Holmes Dec. 1971 96 p refs

(Contract F19628-69-C-0043; AF Proj. 4642)

(AD-738331; TR-177; AFCRL-71-0562) Avail: NTIS CSCL 20/14

Research extending earlier studies of chemical alleviation of the reentry plasma sheath is reported in the areas of plasma sheath chemical composition, the effect of hydrogen on additive effectiveness, and the effect of additives on high power pulse transmission through the plasma sheath. Author (GRA)

N72-24200# Delaware Univ., Newark. Dept. of Electrical Engineering.

COMMUNICATION CHARACTERISTICS OF A POISSON

CHANNEL
Joseph H. Deal, Jr. Sep. 1971 97 p refs
(Grant AF-AFOSR-2015-71; AF Proj. 9768)
(AD-738334; AFOSR-71-2469TR) Avail: NTIS CSCL 09/4

The report presents the results of an investigation of the use of photoelectron counting for the measurement of optical signal intensity variations. This form of measurement provides a means for demodulating optical communication signals when the received light is so weak that the statistics of photoelectron emission are important for signal processing. An experimental system is described which performs this type of measurement and a second order moment or spectral theory for processing photoelectron counts is presented. Experimental measurements are described which verify the theory and show that the count signal has a signal dependent noise explainable by higher order moment theory. Author (GRA)

N72-24201# Hull Univ. (England). Dept. of Psychology.
SONAR RECOGNITION TRAINING: AN INVESTIGATION OF WHOLE VS PART AND ANALYTIC VS SYNTHETIC PROCEDURES Final Report
J. Annett Dec. 1971 70 p refs
(Contract F61052-67-C-0105; NTDC Proj. 7570-5)
(AD-737659; NAVTRADEVCEN-67-C-0105-1) Avail: NTIS CSCL 17/1

A series of experiments is described in which 15 methods of teaching identification of complex sonar-like sounds were compared. These included whole and part methods in which subjects were trained on samples of whole sounds, received pre-training on components of the sounds or were exposed to components in the context of whole sounds. The conditions included variations in order in which training items were presented and in the kinds of verbal instruction given.
Author (GRA)

N72-24202# Raytheon Co., Portsmouth, R.I. Submarine Signal Div.
EFFECTS OF DECISION PARAMETERS ON A DETECTION/LOCALIZATION PARADIGM QUANTIFYING SONAR OPERATOR PERFORMANCE Final Report, 1 Mar. - 30 Nov. 1971
E. F. Rizy Feb. 1972 56 p refs
(Contract N00014-71-C-0232)
(AD-737664; R1156) Avail: NTIS CSCL 17/1

A substantial portion of the noise which attends the evaluation of sonar system performance is attributable to uncontrolled situational variables which affect the sonar operator's reporting. The study defines a composite model of detection and Bayesian decision performance and then applies the model to destroyer sonar operators detecting targets in a real reverberation environment. Prior to detection, the operators are supplied with explicit information on the variables presumed to affect decision. Operator performance supported the concept of a detectability index varying with sonar-input factors but invariant over situational factors, and the concept of an independently estimated decision criterion which varied with situational factors but remained constant over one sonar factor. Author (GRA)

N72-24203# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DETERMINING THE OPTIMUM PARAMETERS OF PATHS BASED ON PROCESSING EXPERIMENTALLY REGISTERED PULSE SIGNALS
Yu. P. Korostin and G. N. Krylov 30 Nov. 1971 15 p Transl. into ENGLISH from Probl. Difraktsii i Rasprosstraneniya Voln (Leningrad), no. 5, 1966 p 144-149
(AD-738382; FTD-MT-24-76-71) Avail: NTIS CSCL 20/14

The authors proposed a different approach to the determination of the waveform of a pulsed signal propagating over the earth's surface. In this approach the initial data are not prescribed signals, but signals obtained as a result of the experiment. It is assumed that limited information is available concerning the initial parameters, and the latter must be determined in optimal fashion. The problem is solved for a source emitting a pulse signal or a sequence of signals of arbitrary shape, and a number of receivers which record this signal. Author (GRA)

N72-24204# Naval Undersea Research and Development Center, San Diego, Calif.
NUMERICAL METHOD FOR SYNTHESIZING GENERAL DIRECTIVITY PATTERNS FOR SONAR ARRAYS Research and Development Report, Jan. 1966 - Dec. 1970
David F. Little Feb. 1972 46 p refs
(SF11121304)
(AD-738015; NUC-TP-279) Avail: NTIS CSCL 17/1

The report presents a simple method of synthesizing patterns of radiated energy for arrays of general geometry and excitation which operate in a linear manner. The mathematical foundation of the method is demonstrated by means of linear algebra. Numerical techniques suggested by the resulting equations are illustrated by three examples which arose from actual sonar design problems not solvable by conventional methods. Author (GRA)

N72-24205# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
REVIEW OF INDIVIDUAL CALLING SYSTEMS IN RADIO COMMUNICATIONS
Henryk Kuniewski 27 Oct. 1971 29 p refs Transl. into ENGLISH from Przeglad Telekomunikacyjny (Poland), v. 43, 37, no. 8/9, 1970 p 261-266
(AD-738235; FTD-HT-23-710-71) Avail: NTIS CSCL 17/2

The author describes the principles underlying various methods of individual, open and selective, calling by means of frequency, time-frequency, and pulse coding along with their classification. The use of these codes in mobile radio communications on land and at sea is reviewed. An analysis is made of the capacity of a radiotelephone network, of call reliability, and of receiver insensitivity to spurious signals.
Author (GRA)

N72-24206# Army Engineer Topographic Labs., Fort Belvoir, Va.
BACKSCATTERING OF ELECTROMAGNETIC WAVES FROM A SURFACE COMPOSED OF TWO TYPES OF SURFACE ROUGHNESS
Richard A. Hevenor Oct. 1971 96 p refs
(DA Proj. 4A0-62112-A-854)
(AD-737675; ETL-TR-71-4) Avail: NTIS CSCL 17/9

The report presents a vector theory for the backscattering of electromagnetic waves from a random, rough surface. The basic technique used is that employed by Dr. Adrian K. Fung in an earlier work. The surfaces used in the report are those that are generated by a stationary Gaussian random process as opposed to surfaces generated by a random array of objects. The former type of surface is assumed to simulate many of the vegetation-free sections of the earth. It is important to understand the basic characteristics of scattering from such surfaces for the purpose of aiding military geographic analysis by radar. Author (GRA)

N72-24207# White Sands Missile Range, N.Mex.
AN/FPS-16(AX) RADAR MODELING AND COMPUTER SIMULATION Final Report
Donald L. Hoihjelle Feb. 1972 25 p refs
(DA Proj. 1U2-65302-D-240)
(AD-738167; STEWS-ID-I-72-2) Avail: NTIS CSCL 17/9

Presented are mathematical models and results of a computer simulation of the range and range-rate channels of the AN/FPS-16(AX) radar. The range channel was simulated from return pulse to digital range servo, and included the IF strip, AGC and split range gate. The range-rate channel simulation consisted of the phase-averaging filter, the limiter, the phase detector and the digital phase-rate tracker. The models were validated by comparing noise and lag errors from the simulation with the corresponding theoretical errors. Author (GRA)

N72-24256# Israel Program for Scientific Translations, Ltd., Jerusalem.
MAGNETIC TAPE RECORDER FOR EXPERIMENTAL DATA
N. M. Kazachuk, V. A. Lvov, and N. S. Poleshchuk *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 63-68 (See N72-24251 15-08)
Avail: NTIS HC $17.00

08 COMPUTERS

Includes computer operation and programming; and data processing. For applications, see specific categories. For related information see also: 19 Mathematics.

N72-24208*# National Aeronautics and Space Administration. Electronics Research Center, Cambridge, Mass.
A BIBLIOGRAPHICAL SURVEYS OF LARGE-SCALE SYSTEMS
William R. Corliss 15 Jan. 1970 50 p refs
(NASA-TM-X-68343) Avail: NTIS HC $4.50 CSCL 09B

A limited, partly annotated bibliography was prepared on the subject of large-scale system control. Approximately 400 references are divided into thirteen application areas, such as large societal systems and large communication systems. A first-author index is provided. Author

N72-24209*# International Business Machines Corp., Huntsville, Ala. Federal Systems Div.
CONCEPTUAL DESIGN OF A 10 TO THE 8TH POWER BIT MAGNETIC BUBBLE DOMAIN MASS STORAGE UNIT AND FABRICATION, TEST AND DELIVERY OF A FEASIBILITY MODEL Final Report
26 Jan. 1972 283 p refs
(Contract NAS8-26671)
(NASA-CR-123577; MSFC-DRL-232) Avail: NTIS HC $16.25 CSCL 09B

The conceptual design of a highly reliable 10 to the 8th power-bit bubble domain memory for the space program is described. The memory has random access to blocks of closed-loop shift registers, and utilizes self-contained bubble domain chips with on-chip decoding. Trade-off studies show that the highest reliability and lowest power dissipation is obtained when the memory is organized on a bit-per-chip basis. The final design has 800 bits/register, 128 registers/chip, 16 chips/plane, and 112 planes, of which only seven are activated at a time. A word has 64 data bits +32 checkbits, used in a 16-adjacent code to provide correction of any combination of errors in one plane. 100 KHz maximum rotational frequency keeps power low (equal to or less than, 25 watts) and also allows asynchronous operation. Data rate is 6.4 megabits/sec, access time is 200 msec to an 800-word block and an additional 4 msec (average) to a word. The fabrication and operation are also described for a 64-bit bubble domain memory chip designed to test the concept of on-chip magnetic decoding. Access to one of the chip's four shift registers for the read, write, and clear functions is by means of bubble domain decoders utilizing the interaction between a conductor line and a bubble. Author

N72-24210*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ITERATIVE COMPUTATION OF GENERALIZED INVERSES, WITH AN APPLICATION TO CMG STEERING LAWS
James W. Steincamp 7 Dec. 1971 17 p refs
(NASA-TM-X-64654) Avail: NTIS HC $3.00 CSCL 09B

A cubically convergent iterative method for computing the generalized inverse of an arbitrary M X N matrix A is developed and a FORTRAN subroutine by which the method was implemented for real matrices on a CDC 3200 is given, with a numerical example to illustrate accuracy. Application to a redundant single-gimbal CMG assembly steering law is discussed. Author

N72-24211*# Computer Sciences Corp., Huntsville, Ala. Field Services Div.
THE MSFC UNIVAC 1108 EXEC 8 SIMULATION MODEL
T. Williams, F. M. Richards, J. E. Weatherbee, and L. K. Paul
31 Mar. 1972 38 p
(Contract NAS8-21085)
(NASA-CR-61379) Avail: NTIS HC $4.00 CSCL 09B

A model is presented which simulates the MSFC Univac 1108 multiprocessor system. The hardware/operating system is described to enable a good statistical measurement of the system behavior. The performance of the 1108 is evaluated by performing twenty-four different experiments designed to locate system bottlenecks and also to test the sensitivity of system throughput with respect to perturbation of the various Exec 8 scheduling algorithms. The model is implemented in the general purpose system simulation language and the techniques described can be used to assist in the design, development, and evaluation of multiprocessor systems. Author

N72-24212# National Defense Research Organization TNO, The Hague (Netherlands). Physics Lab.
REVIEW OF NONCONVENTIONAL METHODS FOR THE REGISTRATION OF OPTICALLY RETRIEVABLE INFORMATION: PREPARATION OF MAGNETO-OPTIC MnBi
N. H. Dekkers Jul. 1971 46 p refs In DUTCH; ENGLISH summary
(PHL-1971-32; TDCK-58983) Avail: NTIS HC $4.50

The possibilities were examined for methods of information storage in materials different from the silver-halogenide films commonly used. On the basis of a comparison of the features of these methods a choice is made for magneto-optical information storage. A survey of the well-known magneto-optical effects is presented along with a description of the Faraday-effect. The efforts undertaken to prepare MnBi in thin-film form and in bulk form are described. Some conclusions are made on the basis of X-ray diffraction patterns. Author

N72-24213# National Defense Research Organization TNO, The Hague (Netherlands). Physics Lab.
DETERMINATION OF THE OPTIMAL NUMBER OF PRINTED CIRCUIT CARDS OF THE COMPUTER MIER
G. Konstantis May 1971 25 p In DUTCH; ENGLISH summary
(PHL-1971-20; TDCK-58799) Avail: NTIS HC $3.25

An attempt was made to determine the number of printed circuit cards of the computer MIER in order to minimize over a long period of time the sum of the initial and expected costs. To this end it was assumed that a number of the existing cards were split-up. A simple mathematical model was then used and the total expected costs were numerically computed. Author

N72-24214*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
OPTIMIZED SOLUTION OF KEPLER'S EQUATION
John M. Kohout and Lamar Layton Washington May 1972 43 p ref
(NASA-TN-D-6712; G-1066) Avail: NTIS HC $3.00 CSCL 09B

A detailed description is presented of KEPLER, an IBM 360 computer program used for the solution of Kepler's equation for eccentric anomaly. The program KEPLER employs a second-order Newton-Raphson differential correction process, and it is faster than previously developed programs by an order of magnitude. Author

N72-24215# Select Committee on Small Business (U. S. Senate).
INTRODUCTION TO NUMERICAL CONTROL
Washington GPO 1971 233 p refs Hearing before Select Comm. on Small Business, 92d Congr., 1st Sess., 24 Jun. 1971 and a study on the Impact of Numerical Control of Small Business prepared by the Small Business Admin., 26 Jul. 1971
Avail: SOD $ 1.00

Computer techniques for numerical control of manufacturing processes and their impact on the depressed state of small aerospace and machine tool industries are discussed. G.G.

N72-24216# Israel Program for Scientific Translations, Ltd., Jerusalem.
COMPUTER ELEMENTS AND SYSTEMS: COLLECTION OF PAPERS, ISSUE NOS. 32-34, 1969
1972 312 p refs Transl. into ENGLISH of the publ. "Vychislitelnye Sistemy" Novosibirsk, Izdatelstvo Nauka Sibirskoe Otdelenie, no. 32-34, 1969 Sponsored by NSF
(TT-71-50054) Avail: NTIS HC $17.75

The application of computer elements and systems for research, product development, and manufacturing is discussed. The data were produced by the Siberian Branch of the Academy of Sciences of the USSR Mathematics Branch. Subjects contained in the report are as follows: (1) technology of computing-medium production, (2) fabrication of thin silicon dioxide films, (3) transient thermal processes in thin film circuits, (4) programmed simulation in computer design, (5) dynamic mass analyzers, and (6) imbeddability of computing media. For individual titles, see N72-24217 through N72-24250.

N72-24217# Israel Program for Scientific Translations, Ltd., Jerusalem.
TECHNOLOGY OF COMPUTING MEDIUM PRODUCTION
A. I. Trubetskoi *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 1-13 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

Various methods for increasing the production of computers and computer component are discussed. Advantages and disadvantages of the several methods are examined. It is concluded that the realization of the technological method proceeds in steps as follows: (1) investigation of the technological processes for production of circuit elements and development of suitable control pickups, (2) construction of an experimental working model of the technological assembly, producing functional blocks of the computing medium, and subsequent improvement of the technological cycle, and (3) final development of a closed-loop technology. Author

N72-24218# Israel Program for Scientific Translations, Ltd., Jerusalem.
THE PROBLEM OF LOW TEMPERATURE TECHNIQUES FOR FABRICATION OF THIN DIELECTRIC FILMS c26
Yu. V. Basikhin, A. D. Sulimin, and A. I. Trubetskoi *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 14-19 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

The fabrication of thin dielectric films and the characteristics of various methods for thin film production are discussed. The technological feasibility of deposition of silicon dioxide films on the surface of a solid body at low temperature is examined. The properties of thin films and the specific applications which are affected by these properties are described. The phenomena which regulate surface reactions under electron or ion excitation are explained. Author

N72-24219# Israel Program for Scientific Translations, Ltd., Jerusalem.
A REACTOR FOR FABRICATION OF THIN FILMS FROM HETERO-ORGANIC COMPOUNDS c26
A. A. Savelev, A. D. Sulimin, Yu. V. Basikhin, and A. I. Trubetskoi *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 20-28 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

The production of thin films by using plasma-chemical reactions is discussed. The structure of a reactor which can be used for experimental fabrication of films from various hetero-organic compounds using plasma excitation of chemical surface reactions is described. The results of probe measurements to determine the parameters of the plasma in the reaction space are presented. Author

N72-24220# Israel Program for Scientific Translations, Ltd., Jerusalem.
A REACTOR FOR FABRICATION OF THIN SILICON DIOXIDE FILMS c26
A. D. Sulimin, A. I. Trubetskoi, and Yu. V. Basikhin *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 29-31 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

A plasma-chemical reactor has been developed for low-temperature fabrication of thin dielectric films from hetero-organic compounds. In the ionization chamber the electrons emitted from the cathode and from the interelectrode space oscillate about the filament anode, so that effective ionization takes place at comparatively low pressures in the discharge chamber. Under certain circumstances, capture of electrons by the field of the filament may cause electrons to flow from the ionization chamber into the vacuum region of the reactor. If the electrons are made to oscillate near the surface of the substrate, a plasma will be formed above the substrate at low pressures of the mixture of gas and reagent vapor. A device operating on this principle is feasible, in particular, if the thin filament anode is introduced through an opening in the ionization chamber and connected to the grid electrode, which is situated between the end face of the cathode chamber and the sample holder. Author

N72-24221# Israel Program for Scientific Translations, Ltd., Jerusalem.
INFRARED MICROSCOPE FOR MONITORING LOCAL TEMPERATURES IN THIN FILM MICROCIRCUITS c14
V. A. Abradzhioni, Yu. A. Nevskii, and V. I. Kokoulin *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 32-36 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

Methods for monitoring the temperature of microelements during the production of computer components are discussed. The basic requirements of the monitoring technique are high resolution and nondestructive and remote control. An infrared microscope for monitoring the local surface temperatures was developed. The instrument measures the energy temperature and operates like a partial-radiation pyrometer. The design of the instrument and its optical circuitry are described. Author

N72-24222# Israel Program for Scientific Translations, Ltd., Jerusalem.
LOCALIZATION OF INTERFERENCE BANDS USING A PIM-3 ELECTRO-OPTICAL SYSTEM c26
V. A. Aradzhioni and N. A. Meshcheryakov *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 37-41 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

The development of an electro-optical system for measuring the kinetics of growth of thin films for elements in groups 4 and 6 of the periodic table is discussed. An interference method is considered for determining the time of formation of thin dielectric films. The length of the localization system of interference bands is equal to the thickness. Each point of the interference field corresponds to a certain path difference which is the difference between the optical paths of the rays interfering at the point. By computing the path difference for all points of the field, it is possible to determine the form of the band and its distribution over the field. Author

N72-24223# Israel Program for Scientific Translations, Ltd., Jerusalem.
INVESTIGATION OF TRANSIENT THERMAL PROCESSES IN THIN FILM MICROCIRCUITS c26
Yu. A. Nevskii and V. A. Aradzhioni *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 42-48 refs

(See N72-24216 15-08)
Avail: NTIS HC $17.75

The development of an experimental apparatus to investigate the transient thermal processes in thin-film microcircuits is discussed. The equipment consists of an infrared microscope which monitors the local temperature at the film surface, an amplifier which increases the strength of the signals received from the radiation receiver, an oscillograph for displaying the amplified signal, and a pulsed supply unit for producing voltage pulses of zero to fifty volts with one second duration. Author

N72-24224# Israel Program for Scientific Translations, Ltd., Jerusalem.
DYNAMIC MASS ANALYZERS, A REVIEW c14
A. E. Rafalson and L. N. Ozerov *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 49-69 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

The theoretical basis, design features, and characteristics of several dynamic mass analyzers are presented. The types of analyzers discussed are radio-frequency, omegatron, time-of-flight, quadrupole, and farvitron. The preferred fields of application for each analyzer are defined. Engineering formulas for analyzer calculations are presented for each system. Author

N72-24225# Israel Program for Scientific Translations, Ltd., Jerusalem.
APPLICATION OF A RADIO FREQUENCY MASS SPECTROMETER FOR MONITORING VACUUM DEPOSITION OF MAGNETIC FILMS c14
V. A. Kaplin and B. P. Malykh *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 70-75 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

The application of radio frequency mass spectrometers for quality control of magnetic films produced by vacuum deposition is discussed. The spectrometer is used to monitor the partial composition of gaseous media throughout the process of deposition in order to maintain the concentration of certain active components at a safe level. The effects of residual gases on the electrophysical properties of vacuum-deposited metallic, ferromagnetic, and semiconductor films are examined. The test equipment and procedures for monitoring the vacuum deposition of iron-nickel alloys with a radio frequency mass spectrometer are illustrated. Author

N72-24226# Israel Program for Scientific Translations, Ltd., Jerusalem.
A GENERATOR OF WOBBLE FREQUENCY FOR RADIO FREQUENCY MASS SPECTROMETERS c14
V. A. Kaplin and A. S. Nudelman *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 76-81 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

The development of a generator for frequency scanning of the mass spectrum in a radio frequency mass spectrometer is discussed. The generator section is based on a tube in the form of a three-phase capacitor network. Continuous tuning of the generator frequency is achieved by magnetic biasing of the high frequency ferrite core which changes the circuit inductance. The total frequency range is divided into three subranges. Switching between subranges is accomplished by simultaneously varying the inductance and capacitance of the circuit, thus improving the uniformity of the generator's amplitude-frequency characteristics. Author

N72-24227# Israel Program for Scientific Translations, Ltd., Jerusalem.
MASS SPECTROMETRIC MONITORING OF GAS DYNAMICS IN EVAPORATION OF TITANIUM, ALUMINUM AND SILICON MONOXIDE c14
V. A. Kaplin, V. V. Konyashkin, and B. S. Potapov *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 82-85 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

The results of mass spectroscopic analysis obtained in the evaporation of titanium, aluminum, and silicon oxide using a radio frequency mass spectrometer are presented. Graphs are developed to show the following relationships: (1) mass spectrum of atmosphere in vicinity of substrate during evaporation of aluminum, (2) variation of partial pressure of carbon monoxide in vicinity of substrate during evaporation of aluminum and titanium, and (3) mass spectrum of atmosphere in vicinity of substrate during evaporation of silicon monoxide. Author

N72-24228# Israel Program for Scientific Translations, Ltd., Jerusalem.
RELIABILITY ANALYSIS OF TRUTH TABLE LOGICAL NETS REALIZED IN A COMPUTING MEDIUM
L. I. Makarov and Yu. V. Merekin *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 87-92 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

Methods of analyzing the reliability of computing medium programs corresponding to truth logical nets are discussed. With certain restrictions on the types of computing medium element failures, these methods reduce the reliability analysis of computing medium programs to reliability analysis of equivalent logical nets. These equivalent logical nets are obtained by replacing computing medium elements by dummy circuits. Mathematical models are included to support the theoretical considerations. Author

N72-24229# Israel Program for Scientific Translations, Ltd., Jerusalem.
IMBEDDABILITY OF COMPUTING MEDIA
A. A. Koifman *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 93-101 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

Currently available methods for setting up adjustment programs for general-purpose computing media have been evolved either for specific computing media (CM) or for certain types of these. Application of computers in setting up CM adjustment programs involves even more allowance for the specific structure of the CM, while the number of different variants and types of CM is constantly growing. A method permitting the utilization of adjustment programs intended for one type of CM in order to set up adjustment programs for other types of similar structure is proposed. Author

N72-24230# Israel Program for Scientific Translations, Ltd., Jerusalem.
AN ALLOCATION OF LOGICS IN A COMPUTING MEDIUM
V. P. Chistov *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 102-107 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

A method for allocation of logics in a two dimensional synchronous computing medium is discussed. The medium contains combinatorial circuits, which are compositions of two-input logic elements with arbitrary branching factor. The circuits may have several input and output terminals. The method used for allocation of a combinatorial circuit in a synchronous computing medium yields connections of equal length between elements of adjacent levels and thus ensures satisfactory operation of the circuit. Application of the method to asynchronous computing media offers certain advantages in design and reduces the time lag in the appearance of signals at the output terminals of the medium. Author

N72-24231# Israel Program for Scientific Translations, Ltd., Jerusalem.
A DECISION ALGORITHM FOR ISOMORPHISM OF NONDIRECTED GRAPHS
V. A. Skorobogatov *In its* Computer Elements and Systems,

Issue Nos. 32-34, 1969 1972 p 108-110 (See N72-24216 15-08)
Avail: NTIS HC $17.75

A method for constructing practical decision algorithms for isomorphism of nondirected graphs, on the basis of a preliminary analysis of the graphs is described. The special conditions which must be met in determining the algorithm and the numerical analyses to support the proposed method are presented. The use of the technique to find a decision algorithm other than direct checking and ways of reducing the amount of checking are examined. Author

N72-24232# Israel Program for Scientific Translations, Ltd., Jerusalem.

RELIABILITY COMPUTATIONS FOR LOGICAL NETS BY SIMULATION

A. Kh. Giorgadze and G. V. Karumidze *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 111-115 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

Reliability computations for logical nets by simulation are presented. The computation requires conversion of a function to a form in which the logic variables can be replaced by numerical variables for machine computation. The steps which must be followed to accomplish the numerical conversion are presented. Mathematical models are included to support the theoretical considerations. Author

N72-24233# Israel Program for Scientific Translations, Ltd., Jerusalem.

REALIZATION OF AUTOMATA IN A CYCLOTRON COMPUTING MEDIUM FROM A GIVEN STATE DIAGRAM

O. L. Bandman *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 116-125 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

A formal method is proposed for constructing incidence matrices directly from the state diagram of the automaton, thus evading the complicated derivation of the canonical equations from the state diagram. The discussion consists of: (1) specification of the automaton, (2) cascade realization of an automaton, (3) incidence matrix of an asynchronous automaton, (4) incidence matrix of a synchronous automaton, (5) contraction of the incidence matrix, (6) derivation of the adjustment program from the incidence matrix, and (7) estimated complexity of realization of an automaton in the medium. Author

N72-24234# Israel Program for Scientific Translations, Ltd., Jerusalem.

ON THE DYNAMICS OF ASYNCHRONOUS AUTOMATA

B. M. Fomel *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 126-139 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

The lower reliability of an automaton is estimated on the basis of a study of continuous dynamic processes in asynchronous automata consisting entirely of superconductive relays - cryotrons. The term dynamic estimate of reliability is used for the minimal admissible stability region of the equilibrium states of the automaton. The stability of the equilibrium states and the nature of the transients are determined by the differential equations of cryotron automata. Each cryotron is described by a step function and characterized by three generalized parameters: (1) time constant, (2) threshold at which superconductivity disappears, and (3) coefficient of internal feedback. Author

N72-24235# Israel Program for Scientific Translations, Ltd., Jerusalem.

COMPUTER ANALYSIS OF THE STABILITY OF A CRYOTRON AUTOMATON

S. M. Achasova *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 140-147 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

The study of the dynamic process taking place in a cryotron automaton revealed the following: (1) The range of parameters alpha, beta for which the dynamic estimate was delta x equals 0.3 is fairly large. (2) Comparing the results with another realization of the same automaton, it was found that the ranges of parameters alpha, beta corresponding to a given dynamic estimate were somewhat different with regard to stability. (3) As regards the method of analysis, the second model was better, since the function was similar to the true resistance characteristic of the cryotron. Author

N72-24236# Israel Program for Scientific Translations, Ltd., Jerusalem.

SPEED OF A CRYOTRON COMPUTING MEDIUM

N. I. Nazarov *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 148-152 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

Results are presented of a numerical analysis of transients in a loop formed by four elements. Instead of the switching speed, the decay rate of a unit current circulating in a superconducting loop, with two resistances switched into the loop at time equal 0, was determined. Described are the transient by the relative rate of decay of current and the relative variation of the time required for decay down to a predetermined level. Results indicate that the switching time of current in relatively small loops is not significantly increased owing to bypassing in the medium, and the operating regime of the medium can be so chosen that bypassing of loops in the medium is no hindrance to satisfactory operation. Author

N72-24237# Israel Program for Scientific Translations, Ltd., Jerusalem.

RESULTS OF TESTING A MODEL CRYOTRON COMPUTING MEDIUM

V. F. Gurko *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 153-158 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

In order to verify the feasibility of cryotron elements of a computing medium of type 3, tests were conducted on a thirty element liquid helium model of a computing medium. Conclusions reached were: (1) Debugging the medium elements in the medium involved no essential difficulties. (2) The speed of response of the medium is at most 100 Hz. (3) Tests of the operation of a flip-flop circuit in the medium have shown that the most reliable operation of the circuit is achieved by ensuring that the medium elements impose no restrictions on the supply current to circuits realized in the medium. Author

N72-24238# Israel Program for Scientific Translations, Ltd., Jerusalem.

ON THE POSSIBILITY OF CRYOTRON DESIGN OF UNIVERSAL COMPUTING MEDIUM ELEMENTS

Ya. S. Kan, V. A. Rakhubovskii, and V. K. Babailov *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 159-170 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

Three variants were considered of a universal element (UE), based on cryotrons, for a homogeneous two-dimensional computing medium (CM) with rectangular coverage. The UE can implement three coupling functions: cross with point, cross without point, break and a relay-contact function. All circuits formed in the medium are subject to the laws of superconductive networks. All variants of the UE were made from wire lead-tin cryotrons and tested in operation. Results are presented of experimental studies on the UE circuits. Author

N72-24239# Israel Program for Scientific Translations, Ltd., Jerusalem.

MOS TRANSISTOR ELEMENTS FOR A COMPUTING AND

STORAGE MEDIUM WITH VARIABLE ADJUSTMENT STRUCTURE c26

E. I. Belyaev, A. I. Mishin, and V. G. Khrushchev *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 171-189 refs (See N72-24216 15-08)

Avail: NTIS HC $17.75

The elements of structurally homogeneous logic and storage devices with variable adjustment structure, based on readjustable (many-dimensional) shift registers were considered. Schematic circuits are presented for medium elements fabricated from MOS-transistors on the principle of circuits with direct connections. A limiting d-c computation of the conditions for normal operation was carried out, allowing for scatter of all circuit parameters. The minimum supply voltage was found and an estimate given for the dependence of this parameter on the number of logic inputs for NOR and NAND circuits. Author

N72-24240# Israel Program for Scientific Translations, Ltd., Jerusalem.

A LANGUAGE FOR DESCRIPTION OF CONSTRUCTIONAL ALGORITHMS FOR COMPUTER DESIGN

S. V. Piskunov, S. N. Sergeev, and B. A. Sidristyi *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 192-200 ref (See N72-24216 15-08)

Avail: NTIS HC $17.75

Any language for the description of constructional algorithms for computer design must provide for both simulation and automatic design. The design process need not then describe the functioning of the device in different languages when performing different tasks. The unified description will be suitable for all purposes; this considerably reduces the number of errors, reduces machine time and facilitates exchange of information among the designers. That part of the full language for description of the computer (called the F-language) which describes constructional algorithms for the computer units with a view to their design was considered. With progress in systems for automatic computer design, the F-language presented here will be extended until it ultimately meets all requirements. Author

N72-24241# Israel Program for Scientific Translations, Ltd., Jerusalem.

TRANSLATION OF F-LANGUAGE DESCRIPTION OF A COMPUTER TO MICROPROGRAM DESCRIPTION

B. A. Sidristyi *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 201-212 refs (See N72-24216 15-08)

Avail: NTIS HC $17.75

Certain binary relations are defined over the set of statements of a constructional algorithm written in F-language. These relations are used to define another language for description of the algorithm, called the R-language. The R-language is considered suitable for various transformations of the original algorithm aimed at optimizing both time and hardware. The procedure of translation into microprogram description would translate the original F-language description into R-language, with all transformations of the original algorithm represented in R-language. A rigorous definition is given of the microprogram description of a computer unit and the formulation of the problem of obtaining such a description is presented. Author

N72-24242# Israel Program for Scientific Translations, Ltd., Jerusalem.

CONSTRUCTION OF THE FUNCTIONAL DIAGRAM OF A COMPUTER ACCORDING TO ITS CONSTRUCTIONAL DESCRIPTION

I. V. Ilovaiskii *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 213-222 refs (See N72-24216 15-08)

Avail: NTIS HC $17.75

A method is described for the construction of the functional diagram and time diagram, given the constructional algorithm of a computer in any notation system. Author

N72-24243# Israel Program for Scientific Translations, Ltd., Jerusalem.

SOME SHORTEST PATH ALGORITHMS

V. A. Tyurenkov *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 223-232 refs (See N72-24216 15-08)

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Some effective algorithms are considered for finding shortest paths between given vertices of an undirected connected graph with edges of positive length. These algorithms usually consist of three parts: initialization, search, and trace. Ford's algorithm is usually used for the construction of shortest paths. The use of this algorithm for reducing computer storage capacity is discussed. Author

N72-24244# Israel Program for Scientific Translations, Ltd., Jerusalem.

ON THE DEGREE OF AN INFORMATIVE GRAPH

M. I. Kratko *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 233-237 refs (See N72-24216 15-08)

Avail: NTIS HC $17.75

Upper bounds are established for the degree of an information graph which is of interest for the design of superhigh speed digital computer systems. Author

N72-24245# Israel Program for Scientific Translations, Ltd., Jerusalem.

VIABLE HOMOGENEOUS GENERAL PURPOSE COMPUTER SYSTEMS

V. G. Khoroshevskii *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 238-255 refs (See N72-24216 15-08)

Avail: NTIS HC $17.75

Quantitative parameters were considered for analysis and synthesis of viable homogeneous general purpose computer systems from reliability and power viewpoints. Results of the investigation revealed that computer systems of high reliability and high power can be synthesized using available electronic computers. Author

N72-24246# Israel Program for Scientific Translations, Ltd., Jerusalem.

COMPUTATION OF THE TRANSIENT RELIABILITY AND REPAIRABILITY FUNCTIONS OF HOMOGENEOUS GENERAL PURPOSE COMPUTER SYSTEMS

E. G. Khoroshevskaya *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 256-271 refs (See N72-24216 15-08)

Avail: NTIS HC $17.75

The nonstationary reliability and repairability functions are computed for the transient regime of a homogeneous general purpose computer system (GCS), for arbitrary initial conditions and arbitrary number of repair units. An ALGOL program is presented for computation of the reliability function. The results are illustrated for various computer systems. Author

N72-24247# Israel Program for Scientific Translations, Ltd., Jerusalem.

SOME PROBLEMS OF PROGRAMMED SIMULATION IN COMPUTER DESIGN

A. G. Shigin *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 272-276 refs (See N72-24216 15-08)

Avail: NTIS HC $17.75

At each stage of computer design, programmed simulation is a suitable and effective tool for experimental verification and evaluation of the projected device. Programmed simulation permits evaluation of available design alternatives and selection of the best, with a relatively small outlay. Here the programmed model (PM) is a tool for studying the object and intensifying our knowledge of it. It is now generally agreed that the PM is an indispensable component of computer design. Author

N72-24248# Israel Program for Scientific Translations, Ltd., Jerusalem.
GENERATION OF A PROGNOSTIC FILTER ON A PROGRAMMED COMPUTER MODEL
I. I. Dzegelenok and A. G. Shigin *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 277-288 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

A systems approach was considered by which a prognostic filter (PF) could be constructed during the random selection of computer variants on programmed models. This application of the PF enabled evaluation of each element of the set of possible structural computer solutions, without recourse to programmed models. Each element was a vector in the initial space of independent variables. The initial space was a discrete medium and each element was a Boolean vector. The starting point of the solution was the hypothesis that the discrete medium contained maximally informative elements. The strategy for the construction of the PF yielded a reduction in total number of experiments on the given set from the standpoint of the object function. Author

N72-24249# Israel Program for Scientific Translations, Ltd., Jerusalem.
EXPERIMENTS ON THE HEURISTIC PROGRAM KONSILIUM FOR A-AUTOMATA
I. I. Dzegelenok, V. Kubera, V. G. Popov, a. L. Syrkin, and A. G. Shigin *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 289-295 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

The heuristic program proposed is in a sense universal in that it yields solutions to a fairly wide range of applied problems related in some way to the problem of prognosis. Questions concerning the organization of adaptive behavior of automata with nondeterministic structure for the solution of prognosis problems were considered. These algorithms have been called A-automata. The method has been tested in the solution of specific problems concerning prognosis of the outcome of repeated myocardial infarcts. Although the approach has been toward medical practice, this does not exclude application of the method to computer design procedures. Author

N72-24250# Israel Program for Scientific Translations, Ltd., Jerusalem.
BEHAVIOR OF AN A-AUTOMATON IN A NONSTATIONARY DISCRETE MEDIUM
I. I. Dzegelenok and A. G. Shigin *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 296-305 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

In investigating complex processes and phenomena with a view to solution of the prognosis problem, it is important to allow for the time variation of the parameters. A prognostic filter (PF) is defined as a functional operator depending on the time dependent arguments. Certain classes of mathematical models of prognostic processes with discrete time scales were considered, and comments are made on their alternative possibilities. The construction of a PF using A-automaton is described. The programmed model af an A-automaton is invariant with respect to the mode of specification of abstract synthesis. In practice, the information is applied to the input of the A-automaton with the aid of service encoding subroutines. Service subroutines occupy negligible space in comparison with the programmed model of the A-automaton. Author

N72-24251# Israel Program for Scientific Translations, Ltd., Jerusalem.
COMPUTER ELEMENTS AND SYSTEMS: COLLECTION OF PAPERS, ISSUES NOS. 35-37, 1969
1971 297 p refs Transl. into ENGLISH from the Publ."Vychislitelnye Sistemy" Novosibirsk, Izdatelstvo Nauka Sibirskoe Otdelenie, nos. 35-37, 1969 Sponsored by NSF
(TT-71-50054) Avail: NTIS HC $17.00

A series of reports on computer elements and systems are presented. The data were prepared by the Siberian Branch of the Academy of Sciences of the USSR Mathematics Institute. Subjects discussed include the following: (1) methods of automation of experimental research, (2) man-computer communication in automation of scientific research, (3) tablets for graphic data input to computers, (4) nature of the pattern recognition problem, (5) automatic recognition of 200 voice commands, and (6) comparison of decision functions as to power and cost. For individual titles, see N72-24252 through N72-24287.

N72-24252# Israel Program for Scientific Translations, Ltd., Jerusalem.
METHODS FOR AUTOMATION OF EXPERIMENTAL RESEARCH
V. A. Lvov *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 1-19 refs (See N72-24251 15-08)
Avail: NTIS HC $17.00

Analysis of technological means toward implementation of an industrial basis for manufacture of computer systems elements shows that both development of the technological process and running of the equipment must go hand in hand with extensive control, aimed at automated analysis of the process, search for optimum conditions, control and maintenance of operating conditions during operation of the equipment. Design and investigation of the elements' circuits should also be based on automated systems which allow rapid survey of numerous variants and choice of the most suitable. The design procedure should yield all technical documentation necessary for the production stage. All these examples presuppose the availability of highly-developed and convenient means of communication between the researcher (operator) and the system for automation of experimental research. Based on these considerations, one can conclude that successful creation of high-power computer systems is conditional on a large amount of work on automation of research and design. This can be accomplished by developing suitable methods and tools. Author

N72-24253# Israel Program for Scientific Translations, Ltd., Jerusalem.
A SYSTEM FOR AUTOMATED RESEARCH IN EXPERIMENTAL SOLID STATE PHYSICS
I. S. Lisker *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 20-47 refs (See N72-24251 15-08)
Avail: NTIS HC $17.00

Theoretical and experimental work on the physical basis of variational methods for experimental determination of electrophysical, thermophysical, galvano- and thermomagnetic properties of solid bodies are discussed. These methods are based on making allowance for the following physical features apparent in the intersection of the objects of investigations with external factors (EF): (1) a single EF applied to the object may induce a response in the latter as if it were acted upon by a certain combination of several EF; (2) to establish the response of the object to each of the EF figuring in the experiment, the factors are applied to the object (or removed from it) discretely, in a certain time sequence conditioned by the objective of the experiment; and (3) the time during which a factor or a combination of factors is applied to (or removed from) the object is determined by the time required to return the object to the thermodynamic equilibrium disturbed by the action of the factor(s). Author

N72-24254# Israel Program for Scientific Translations, Ltd., Jerusalem.
MAN COMPUTER COMMUNICATION IN AUTOMATION OF SCIENTIFIC RESEARCH
V. A. Alekseev and V. A. Lvov *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 48-55 refs (See N72-24251 15-08)
Avail: NTIS HC $17.00

The output of experimental results from computers is discussed. The output involves two steps as follows: (1) the

output and measurement of the data must proceed at a high rate and the required editing and data representation must be simple, and (2) following the creative part of the research process, the principal demand from data output is the quality of representation. Data processed by the computer should be ready, without further treatment, for publication or for use as basic technical documentation. Methods for achieving these goals are described. Author

N72-24255# Israel Program for Scientific Translations, Ltd., Jerusalem.
UNIT FOR AUTOMATION OF EXPERIMENTAL RESEARCH
A. V. Komarov, N. S. Kormilitsyn, and I. S. Lisker *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 56-62 refs (See N72-24251 15-08)
Avail: NTIS HC $17.00

The development of a computer unit for automatic programmed control of physical experiments in scientific research and industrial laboratories is discussed. The results obtained by using equipment with rigidly programmed control which records the data on carriers in the computer code are examined. The advantages obtained through the comparative simplicity, relatively small size, and low cost of the units are described. Author

N72-24256# Israel Program for Scientific Translations, Ltd., Jerusalem.
MAGNETIC TAPE RECORDER FOR EXPERIMENTAL DATA c07
N. M. Kazachuk, V. A. Lvov, and N. S. Poleshchuk *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 63-68 (See N72-24251 15-08)
Avail: NTIS HC $17.00

A four channel device for automatic measurement of input voltages which records the results digitally on 6.25 millimeter magnetic tape is described. The device permits successive conversion of four input signals with voltage from zero to three volts into binary five-bit code at frequencies reaching 200 cycles per second or at frequencies of up to 400 and 800 cycles per second when only two or one channels are used. It is concluded that there is no difficulty in designing a recorder for any number of bits, provided a suitable analog to digital converter is available. Author

N72-24257# Israel Program for Scientific Translations, Ltd., Jerusalem.
ON-LINE COMPUTER PROCESSING OF NEUROPHYSIOLOGICAL DATA
V. A. Alekseev, N. N. Glushkov, and V. A. Lvov *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 69-74 refs (See N72-24251 15-08)
Avail: NTIS HC $17.00

A block-diagram of the complex for automatic input and statistical processing of the induced or spontaneous impulse activity of neurons, using a preassigned set of programs, is presented. The electrical pulses corresponding to the impulse activity of the neurons are first recorded on magnetic tape or transmitted during the experiment along the communication lines to the computer; they then proceed to a shaper which performs amplitude selection of the pulses and shapes them by level and duration in order to match the computer's input unit. The cut-off level of the signal is chosen manually and the results checked by comparing the pulses at the output and input of the shaper on the screen of a two-ray oscillograph. The shaper contains several channels for amplitude selection so that the pulses can be applied in sequences proceeding simultaneously along different channels from several neurons; alternatively, two sequences can share a single channel, provided the pulses of the neurons are sufficiently different in amplitude. The shaped impulses are applied to the register for reference to discrete sensing units in the communication unit. Author

N72-24258# Israel Program for Scientific Translations, Ltd., Jerusalem.
AUTOMATED CHROMATOGRAPHY WITH A GENERAL PURPOSE CONTROL COMPUTER
V. A. Alekseev, V. F. Kollegov, V. A. Lvov, and B. A. Malevanyi *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 75-80 refs (See N72-24251 15-08)
Avail: NTIS HC $17.00

The automation of chromatographic analysis using on-line input of signals from the detector to a general purpose computer is discussed. General purpose computers not only yield an exhaustive analysis of chromatographic data, but one general purpose computer can deal simultaneously with ten chromatographs and actively influence the chromatographic process. The development and application of the general purpose computers for controlling chromatographs and providing remote reading capability are described. Author

N72-24259# Israel Program for Scientific Translations, Ltd., Jerusalem.
AUTOMATED INVESTIGATION OF THE CHARACTERISTICS OF A THIN FILM SWITCHING ELEMENT c09
S. I. Konyaev and N. F. Sychev *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 81-86 ref (See N72-24251 15-08)
Avail: NTIS HC $17.00

The application of computers for automated investigation of the characteristics of a thin film switching element is discussed. In order to increase the measurement and processing rates in industrial applications, an automated experimental scheme was developed which operates in conjunction with a computer according to an established algorithm. The electrical circuits, computer programming instructions, and computer graphics outputs are presented. It is concluded that the application of computers for processing and measurement of experimental data during manufacturing leads to a reduction in the time required to develop the technology and yields more reliable experimental results. Author

N72-24260# Israel Program for Scientific Translations, Ltd., Jerusalem.
COMPUTERIZED CONTROL OF DEPOSITION OF FILMS WITH GIVEN THICKNESS c26
V. A. Lvov, V. A. Sterelyukhin, and E. I. Cherepov *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 87-89 refs (See N72-24251 15-08)
Avail: NTIS HC $17.00

The application of computers for controlling the vacuum deposition of films is discussed. The introduction of feedback concerning the evaporation rate is the basis for such control. Control computers which allow for variations in evaporation rate during the process, based on the escape of vapor molecules from the evaporator are described. It was demonstrated that the variance of the film thickness can be reduced by a factor of almost 2 if a computer is used to correct the deposition time. Author

N72-24261# Israel Program for Scientific Translations, Ltd., Jerusalem.
TABLETS FOR GRAPHIC DATA INPUT TO COMPUTERS
D. A. Kozlov and V. A. Lvov *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 90-94 refs (See N72-24251 15-08)
Avail: NTIS HC $17.00

Man-computer collaboration by the exchange of graphic patterns is discussed. The use of semiautomated devices for assisting in the graphic interpretation of data is described. Semiautomatic drawing boards (tables) have a working field and a cursor which the human operator sets manually to the required point, whose coordinates are automatically encoded and stored in the computer or on a computer-readable device. Instructions for using the equipment and examples of semiautomated data handling are presented. Author

N72-24262# Israel Program for Scientific Translations, Ltd., Jerusalem.

GRAPHIC OUTPUT ON THE SCREEN OF A CRT

V. A. Lvov and N. F. Sychev *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 95-100 refs (See N72-24251 15-08)

Avail: NTIS HC $17.00

The application of cathode ray tubes for displaying computer graphics data is discussed. The cathode ray tube presentations allow the operator to introduce additional data into the computer during the solution process and to edit the results. The image on the CRT may be any alphanumeric text, graphic drawing, complete with legends and dimensions, or a diagram with various symbols. The many ways in which images can be presented on cathode ray tubes are described. Author

N72-24263# Israel Program for Scientific Translations, Ltd., Jerusalem.

AUTOMATIC DATA INPUT IN COMPUTING MEDIA

A. I. Mishin, N. F. Sychev, and V. G. Krushchev *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 101-104 refs (See N72-24251 15-08)

Avail: NTIS HC $17.00

The development of automatic data input in computing media is discussed. The system under consideration consists of the following: (1) a digital computer, (2) a computing medium block, (3) adjustment-data input unit to computer (including input tablet), (4) visual adjustment control unit, (5) unit for data input from computer to adjustment field of medium, (6) unit for data input from computer to logic field of medium, and (7) unit for data output from medium to computer. The various units are described and their contribution to the overall operation is explained. Author

N72-24264# Israel Program for Scientific Translations, Ltd., Jerusalem.

A COMPLEX OF PERIPHERAL GRAPHIC UNITS FOR COMPUTERS

V. P. Vasilev, E. S. Vorovin, E. L. Emelyanov, K. P. Kashcheev, D. I. Kunin, V. G. Ovchinnikov, Yu. A. Romanenko, Yu. M. Fedoruk, M. A. Shemyakin, and V. V. Yakushkin *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 105-113 refs (See N72-24251 15-08)

Avail: NTIS HC $17.00

Various methods for automatic input of measurement data to a computer are discussed. In one approach the data are converted to digital code concurrently with their graphic registration; the code is recorded on intermediate carriers or transmitted directly to the immediate-access memory of the computer. This method is of limited efficiency, since the response of the recorders (punches) is small, general-purpose magnetic recorders are not available, and direct input to the computer is not always feasible. Another method is to use special devices to convert the data from graphic form (graphs, diagrams, oscillograms, cards, etc.) to codes which are recorded on intermediate carriers or transmitted directly to the computer's immediate-access memory. The advantages of this method are: the possibility of active participation of the operator in collecting the data for subsequent coding and computer input; the possiblity of matching the speeds of the converter and the output register. A disadvantage is that the data collection procedure is complicated and the accuracy of the data depends on the quality of the graphic recording. Author

N72-24265# Israel Program for Scientific Translations, Ltd., Jerusalem.

AN ADAPTIVE SERVOSYSTEM WITH DIGITAL CONTROL UNIT c10

V. A. Alekseev *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 114-123 refs (See N72-24251 15-08)

Avail: NTIS HC $17.00

The creation of microminiature elements for computer systems and detailed development of various technological processes are discussed. The majority of modern technological cycles for production of thin-film and solid-state circuits provide for simultaneous follow-up of several time-dependent and interdependent parameters. In view of the complexity and inadequately known characteristics of the controlled objects, the use of mass-produced analog regulators is difficult and inefficient. Under such conditions, it is much more convenient and promising to use adaptive regulators which make use of the computational and logical potential of digital-computer technology. One form of a technological digital regulator is a set of programs stored in the memory of a general-purpose control computer (GCC). The digital regulator operates in a closed cycle of discrete operations, including determination of the present dynamic characteristics of the object, computation of the control signals according to a preset algorithm, and correction of the algorithm. Author

N72-24266# Israel Program for Scientific Translations, Ltd., Jerusalem.

SOME PROBLEMS IN EXPERIMENT DESIGN

V. I. Denisov *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 p 124-128 refs (See N72-24251 15-08)

Avail: NTIS HC $17.00

Problems in experimental design are discussed. The application of Box's theorem to real objects is examined. The investigated objects are divided into Euclidean and non-Euclidean types. Mathematical models are presented to establish the relationships between the objects. Various theorems and proofs are explained to support the theoretical considerations. Author

N72-24267# Israel Program for Scientific Translations, Ltd., Jerusalem.

AUTOMATIC RANGE SELECTOR FOR THE F116 INSTRUMENT c14

N. S. Kormilitsyn *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 129-132 (See N72-24251 15-08)

Avail: NTIS HC $17.00

The development of automatic range selectors for use with recording units to provide self-contained analog measurement complexes is discussed. The specific equipment consists of a direct current microvolt-microammeter and a recording potentiometer with zero to ten millivolt range. The circuits and components of the equipment are described. The accuracy of the readings is determined. The various uses to which the instrument has been placed are examined. Author

N72-24268# Israel Program for Scientific Translations, Ltd., Jerusalem.

INPUT UNIT FOR ELECTRICAL DATA IN THE PROMIN COMPUTER

I. S. Lisker and L. M. Tankhilevich *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 133-139 refs (See N72-24251 15-08)

Avail: NTIS HC $17.00

The data processing algorithm (DPA) in an automated research system (ARS) is discussed and its implementation by a digital computer is described. Data processing was performed in an ARS with a small Promin computer. Apart from the usual input channel for digital data, the computer was provided with an additional unit for electrical data. The analog to digital converter in a device of this type may be any digital voltmeter with discrete of digital print output. The electrical-data input unit of the computer, which facilitates automation of the complete experiment is presented. Author

N72-24269# Israel Program for Scientific Translations, Ltd., Jerusalem.

UNIT FOR WIDE RANGE MEASUREMENT OF ELECTRICAL SIGNALS IN DIGITAL FORM c14

V. G. Abramov, I. S. Lisker, and G. D. Roshchin *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 140-145 refs (See N72-24251 15-08)

Avail: NTIS HC $17.00

A unit has been developed, a digital measurement complex, which enables the user to extend the measurement of electrical signals by several orders of magnitude, and thereby lowering the threshold of response to a few microvolts with comparatively rapid response of the measurement system. The results are obtained in digital form. A.L.

N72-24270# Israel Program for Scientific Translations, Ltd., Jerusalem.

JOINT OPERATION OF DNEPR AND UM1-NKh COMPUTERS

Kim Sun and I. S. Timokhina *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 146-151 (See N72-24251 15-08)
Avail: NTIS HC $17.00

The increasingly stringent conditions imposed on the response of the input/output units of computers, as well as the greater volume of data and the degree of its conversion required for on-line solution of many complex problems, have necessitated combining the DNEPR and UM1-NKh computers into a single hierarchical system. Joint operation of the two computers in the system accelerates the data collection procedure and ensures more complete utilization of the computational potential and communication units of both computers. Author

N72-24271# Israel Program for Scientific Translations, Ltd., Jerusalem.

NATURE OF THE PATTERN RECOGNITION PROBLEM

N. G. Zagoruiko and K. F. Samokhvalov *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 153-159 refs (See N72-24251 15-08)
Avail: NTIS HC $17.00

This investigation attempted to answer two questions: (1) What is the essence of the pattern recognition problem? (2) What should a general theory of pattern recognition look like? The following conditions were imposed on the general theory: (1) The theory must be abstract in order to be universal. (2) General theory must provide a sufficiently complete representation of the specific features of any problem, in order to be useful. (3) Theory must be constructive in that it incorporates a universal recognition algorithm. The scheme for a theory of pattern recognition and the concrete definition proposed for the simplicity concept may be subjected to further alterations. It may develop that in concrete cases the general algorithm is so complicated that a more simplified analog must be found. Author

N72-24272# Israel Program for Scientific Translations, Ltd., Jerusalem.

OPTIMUM STRUCTURE OF HIERARCHIC RECOGNITION AUTOMATA

G. Ya. Voloshin *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 160-171 refs (See N72-24251 15-08)
Avail: NTIS HC $17.00

Data indicate that in cases when the redundancy of the initial description and the number of patterns are large, introduction of intermediate levels of recognition considerably reduces the cost of the classifier. The theoretical optimum is a two-level pyramidal automation with sliding recognition of two patterns in each of its disjoint subspaces. Restrictions may be imposed on the dimensionalities of the subspaces in which the intermediate decisions are made. It becomes necessary to consider subspaces which are either not disjoint or contain more than two patterns. It is clear that each concrete recognition problem corresponds to a specific structure of recognition automaton. Only the limiting cases have been investigated which would be used in constructing recognition automata and algorithms. Author

N72-24273# Israel Program for Scientific Translations, Ltd., Jerusalem.

QUANTITATIVE CRITERIA FOR QUALITY OF TAXONOMIC CLASSIFICATION: THEIR APPLICATION TO DECISION MAKING PROCEDURES

V. N. Elkina and N. G. Zagoruiko *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 172-182 refs (See N72-24251 15-08)
Avail: NTIS HC $17.00

Criteria have been determined for the quality of a taxonomy in the absence of a supergoal. Two nearly optimal taxonomy algorithms are described and their application in solving problems is discussed. The results of the taxonomy depend to a significant degree on the metric of the sample space. One way to ensure compatibility of the results in solution of different problems is to normalize the measurement scales of all features. Author

N72-24274# Israel Program for Scientific Translations, Ltd., Jerusalem.

SIMULTANEOUS SEARCH FOR AN EFFICIENT SYSTEM OF FEATURES AND THE BEST VARIANT OF TAXONOMY (SX ALGORITHM)

N. G. Zagoruiko *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 183-185 refs (See N72-24251 15-08)
Avail: NTIS HC $17.00

The SX algorithm is proposed for the solution of multilevel recognition systems. The procedure for solving the combined problem reduces to successive application of algorithms for solution of the two basic problems. The order in which these algorithms are applied and the rules for transition from one algorithm to the other are described. Author

N72-24275# Israel Program for Scientific Translations, Ltd., Jerusalem.

THE CONSTRUCTION OF LINEAR DECISION FUNCTIONS FOR THE SEPARATION OF S CLASSES (S MORE THAN 2)

R. M. Malkina *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 186-189 refs (See N72-24251 15-08)
Avail: NTIS HC $17.00

A possible algorithm is presented for the generation of decision rules for the separation of S classes, the number of separating hyperplanes of which is close to the minimum necessary. The classes are convex and their covariance matrices may be different. A tentative experiment on separation of two-dimensional convex classes with different covariance matrices was used to judge the proposed method. The number of separating lines was found to be close to the optimum and less than this if the packing density of the classes was small. Author

N72-24276# Israel Program for Scientific Translations, Ltd., Jerusalem.

A PROGRAM FOR SYNTHESIS OF RECURSIVE DIGITAL FILTERS (RDF)

V. S. Lozovskii *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 190-209 refs (See N72-24251 15-08)
Avail: NTIS HC $17.00

The problem of computer modeling the transmission of a given signal by a frequency selective network was examined. Of the two known methods which assure minimum-time filters, the recursive digital filters (RDF) technique was used. RDF synthesis may be performed in various ways, depending upon the associated requirements and restrictions. The input signal to the filter is represented by discrete values with the prescribed quantization interval. RDF synthesis consists of finding the coefficients which fully describe the behavior of the filter. The approach taken in this investigation implied that the filter system was described by a system of linear difference equations with constant coefficients, found by the well-known z-transform technique. Author

N72-24277# Israel Program for Scientific Translations, Ltd., Jerusalem.

SOME PROGRAMS FOR SIGNAL CORRELATION ANALYSIS

V. D. Gusev *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 210-215 refs (See N72-24251 15-08)

Avail: NTIS HC $17.00

Two programs for correlation analysis are presented: Koran-1 and Koran-2. The programs were written in input language and are intended for the BESM-6 computer. The programs are intended for processing large arrays of initial data recorded on magnetic tape. The programs have been utilized mainly in processing vocal signals. The Koran-1 program is intended for computation of the normalized autocorrelation function and the normalized cross correlation function for any pair of signals in the given collection. The Koran-2 program is intended to reveal possible linear correlations between a given sequence of random variables and all other sequences in certain initial set. The initial data in both programs are presented in a two-dimensional array.
Author

N72-24278# Israel Program for Scientific Translations, Ltd., Jerusalem.

AUTOMATIC RECOGNITION OF A LIMITED SET OF VOCAL COMMANDS

V. I. Velichko and N. G. Zagoruiko *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 216-223 refs (See N72-24251 15-08)

Avail: NTIS HC $17.00

Experiments on recognition of a vocabulary of 168 words are described. As initial material all the terms of COBOL-60 were taken along with a few terms from the alpha-translator input language and the names of a few elementary functions. Most of the names of the Cyrillic and Latin letters were replaced by proper names. In this experiment the speech signal was described with the help of the following system of features. The acoustic signal was passed through a system of five second-order filters. The center frequencies of the filters were 112.5, 450, 900, 1800, and 7200 Hz. The passband of each filter at level 0.5 was equal to the center frequency, corresponding to a filter Q-factor of 2.45. Each word was divided into segments of fixed length of 14 msec. For each signal the signal energy in the total band was computed. Results showed that the method yields practically acceptable reliability in recognition of 150 to 200 words if the system is capable of being adjusted to the speaker by having all words of the vocabulary pronounced once. Author

N72-24279# Israel Program for Scientific Translations, Ltd., Jerusalem.

CONTRACTION OF A SIGNAL AND SEGMENTATION OF SPEECH INTO PHONEMES

B. M. Kurilov and B. P. Gavrilko *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 224-228 refs (See N72-24251 15-08)

Avail: NTIS HC $17.00

An experiment with speech signals was conducted on the BESM-6 computer. The speech signal was input to the computer through a 9-bit analog to digital converter with frequency sampling 20 KHz and then passed through a rack of digital mathematical filters. At the filter outputs, the functions were computed and printed in graphical form. The computed values of these functions were then used to calculate the segmentation function manually. The functions were not used for segmentation. The spoken material used consisted of 23 Russian words, 10 English words, and 10 Japanese words. The number of phonemes was 410. Author

N72-24280# Israel Program for Scientific Translations, Ltd., Jerusalem.

A RIGOROUS SIMPLICITY HYPOTHESIS

B. P. Gavrilko, N. G. Zagoruiko, and K. F. Samokhvalov *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 229-233 refs (See N72-24251 15-08)

Avail: NTIS HC $17.00

The simplest decision function which recognizes the training sequence with given accuracy will also recognize the control sequence with the greatest accuracy. The difficulty is how to define simplicity, to specify what structure or decision function should be considered the most simple. The concept must either remain intuitive or be formulated in terms of a finite automaton realizing some decision function. It would be desirable to define the decision function and a measure of its complexity in such a way that the function itself be invariant under admissible changes of scale, in which the features are varied, and the complexity measure invariant with respect to all modes of programming and independent of the language of the automaton being used. Some facts from the theory of models are presented.
Author

N72-24281# Israel Program for Scientific Translations, Ltd., Jerusalem.

COMPARISON OF DECISION FUNCTIONS AS TO POWER AND COST

N. G. Zagoruiko *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 234-237 refs (See N72-24251 15-08)

Avail: NTIS HC $17.00

Any exhaustive comparative index must obviously depend not only on the power but on the cost involved in using the algorithm. Algorithms were compared according to these indices. The decision functions considered were: (1) linear decision function (hyperplane); (2) sphere; (3) general second-order surface; and (4) polynomial surface. No decision function can be used unless the computer memory is capable of storing its parameters. The number of parameters increases sharply with the complexity of the decision function. Tabular data are given for computer requirements based on the four types of decision functions. Author

N72-24282# Israel Program for Scientific Translations, Ltd., Jerusalem.

DECISION RULES IN HIERARCHIC RECOGNITION AUTOMATA

G. Ya. Voloshin *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 238-243 refs (See N72-24251 15-08)

Avail: NTIS HC $17.00

The complexity of the decision rules for the optimal structure of hierarchic recognition automata were estimated. The hierarchization process involves making intermediate decisions in subspaces. If the sample is representative and there are no restrictions on the type of decision rule, this procedure cannot reduce the cost of losses. Therefore, hierarchization will, on the one hand, reduce the cost of the classifier and, on the other, increase the cost due to losses. In order to ensure that the cost of losses does not increase by more than the admissible amount in the hierarchization procedure, certain transformation is applied to the initial space. A family of optimal decision rules have been constructed and are described. Author

N72-24283# Israel Program for Scientific Translations, Ltd., Jerusalem.

APPROXIMATING THE RESPONSE OF A SYSTEM IN THE z-PLANE AND FORMANT ANALYSIS OF SPEECH

V. S. Lozovskii *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 244-256 refs (See N72-24251 15-08)

Avail: NTIS HC $17.00

A technique is described for the formant analysis of speech signals. A formant description of the speech signal means a pole-zero representation of the transfer function of some model system whose response approximates the signal in the time domain to within the desired accuracy. The spectrum of the signal considered was the product of the spectrum of the exciting signal and the transfer function of the resonator system. A dynamic model of the process is described and results are presented of an experiment conducted on a bandpass filter using the technique. Author

N72-24284# Israel Program for Scientific Translations, Ltd., Jerusalem.

IDENTIFICATION OF SITUATIONS BY DYNAMIC FEATURES (DYF ALGORITHM)

N. G. Zagoruiko and K. F. Samokhvalov *In its* Computer Elem.

and Systems, Issue nos. 35-37, 1969 1971 p 257-260 ref (See N72-24251 15-08)
Avail: NTIS HC $17.00

A dynamic features algorithm has been developed for use with the BESM-6 computer for the processing of binary features. The technique was applied to the investigation of a geological region in which several metalliferous and nonmetalliferous deposits occurred. The algorithm identified 17 pairs of the total 22 deposits correctly. This algorithm should permit the determination of the pattern of the most promising deposits in a geologic region. Author

N72-24285# Israel Program for Scientific Translations, Ltd., Jerusalem.
A NETWORK ALGORITHM FOR IDENTIFICATION OF PHONEMES BY SEQUENCES OF SEGMENTS
G. Ya. Voloshin, I. B. Bakhmutova, and A. A. Prokopenko *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 261-263 refs (See N72-24251 15-08)
Avail: NTIS HC $17.00

Results are presented of an experimental test of the network method of speech recognition from a sequence of unreliably identified segments. The algorithm employed data on the time dependent and linguistic regularities of the Russian language and identified phonemes from unreliably identified segments. The results depended essentially on the form of the matrix being processed, however, the model experiments demonstrate the fairly high potential effectiveness of the method. Author

N72-24286# Israel Program for Scientific Translations, Ltd., Jerusalem.
STATISTICS OF TWO AND THREE PHONEME COMBINATIONS IN RUSSIAN
V. N. Elkina, V. N. Yudina, and A. G. Khairetdinova *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 264-288 refs (See N72-24251 15-08)
Avail: NTIS HC $17.00

Tables were constructed of two- and three-phoneme combinations (dyads and triads) of Russian speech, valid primarily for technical and mathematical literature. The algorithm translated the written text into a phonetic transcription representing all features of spoken Russian. The initial material consisted of texts containing 1,500,000 combinations. Frequency tables of dyads and triads were compiled by the computer on the basis of the transcribed texts and included only dyads occurring at least 100 times and triads occurring at least 50 times. Author

N72-24287# Israel Program for Scientific Translations, Ltd., Jerusalem.
AUTOMATIC RECOGNITION OF 200 VOCAL COMMANDS
V. M. Velichko and N. G. Zagoruiko *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 289-291 ref (See N72-24251 15-08)
Avail: NTIS HC $17.00

Results are presented of statistical tests conducted on recognition of 203 vocal commands. The general reliability of the recognition average over approximately 4600 realizations, was 95.2%. Author

N72-24288*# Applied Magnetics Corp., Goleta, Calif.
IMPROVEMENTS OF MAGNETIC HEADS THROUGH THE USE OF NEW AND REFINED CORE MATERIALS Final Report
1 May 1972 17 p ref
(Contract NAS5-10117)
(NASA-CR-122403) Avail: NTIS HC $3.00 CSCL 14C

A process for making ferromagnetic films with high permeability and development of the technology for fabricating a magnetic head using these films are reported. An interim head was successfully built, tested, and delivered for evaluation and a process for sputtering high permeability films has been developed. Two heads with deposited pole tips have been tested and delivered. One had a 0.0001 inch gap and the other a 0.0003 inch gap. Both heads were boned with epoxy but served to test the geometry of the head design. Author

N72-24289*# NUS Corp., Rockville, Md.
MODIFICATION OF CODES NUALGAM AND BREMRAD, VOLUME 1 Final Report
J. J. Steyn, R. Huang, and H. Firstenberg May 1971 109 p refs
(Contract NAS5-11781)
(NASA-CR-122407; NUS-786/1-Vol-1) Avail: NTIS HC $7.50 CSCL 09B

The NUGAM2 code predicts forward and backward angular energy differential and integrated distributions for gamma photons and fluorescent radiation emerging from finite laminar transport media. It determines buildup and albedo data for scientific research and engineering purposes; it also predicts the emission characteristics of finite radioisotope sources. The results are shown to be in very good agreement with available published data. The code predicts data for many situations in which no published data is available in the energy range up to 5 MeV. The NUGAM3 code predicts the pulse height response of inorganic (NaI and CsI) scintillation detectors to gamma photons. Because it allows the scintillator to be clad and mounted on a photomultiplier as in the experimental or industrial application, it is a more practical and thus useful code than others previously reported. Results are in excellent agreement with published Monte Carlo and experimental data in the energy range up to 4.5 MeV. Author

N72-24290*# NUS Corp., Rockville, Md.
MODIFICATION OF CODES NUALGAM AND BREMRAD, VOLUME 2: CODE USER MANUAL Final Report
J. J. Steyn and R. Huang May 1971 94 p
(Contract NAS5-11781)
(NASA-CR-122408; NUS-786/2-Vol-2) Avail: NTIS HC $16.75 CSCL 09B

A code user manual is presented for the NUGAM2 and NUGAM3 Monte Carlo computer programs. General operating instructions for both programs are given along with sample input and output listings. D.L.G.

N72-24291*# NUS Corp., Rockville, Md.
MODIFICATION OF CODES NUALGAM AND BREMRAD, VOLUME 3: STATISTICAL CONSIDERATIONS OF THE MONTE CARLO METHOD Final Report
H. Firstenberg May 1971 37 p
(Contract NAS5-11781)
(NASA-CR-122409; NUS-786/3-Vol-3) Avail: NTIS HC $4.00 CSCL 09B

The statistics are considered of the Monte Carlo method relative to the interpretation of the NUGAM2 and NUGAM3 computer code results. A numerical experiment using the NUGAM2 code is presented and the results are statistically interpreted. Author

N72-24292# Joint Publications Research Service, Arlington, Va.
INFORMATION SERVICING OF AUTOMATIC CONTROL SYSTEMS
A. M. Nikiforenko 19 May 1972 86 p Transl. into ENGLISH from Standarty i Kachestvo (Moscow), no. 3, 1972
(JPRS-56047) Avail: NTIS HC $6.50

The report examines problems in the field of the theory and practice of classification and coding of technical-economic information and the application of classifiers in automatic control systems. Author

N72-24293# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
SOME MODIFICATIONS CONCERNING PREVIOUS

PSYCHIATRIC DATA MEDICAL RECORDING SYSTEMS
D. Giucci, P. Pancheri (Rome Univ.), L. Pastena (Rome Univ.), and D. Veggetti 11 Jun. 1971 54 p refs In ITALIAN; ENGLISH summary
(ISS-71/13) Avail: NTIS HC $4.75

A revised medical recording system for the acquisition and electronic processing of data concerning clinical psychiatry is outlined. The system is organized in the form of a series of questions in which collected informations are coded for consequent punching on cards. This allows for easy filing of data and processing by computer. Author

N72-24294# Centre National de la Recherche Scientifique, Marseilles (France). Lab. d'Astronomie Spatiale.
COMPUTER PROGRAMS FOR PROCESSING THE DATA IN ASTROPHYSICAL EXPERIMENTS [PROGRAMMES DESTINES AU DEPOUILLEMENT DES EXPERIENCES D'ASTROPHYSIQUE]
J. C. Gonin and A. Rabearivelo 1971 51 p refs In FRENCH
(CALC-01-72) Avail: NTIS HC $4.75

Computer programs for photographic data processing are described. They include programs and subroutines for simulation of the optical systems used in experiments, estimation of energies received from stellar models and the processing of the photographic data. Author (ESRO)

N72-24295# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computing.
BABEL AND SOAP: AN APPLICATION OF EXTENSIBLE COMPILERS
R. S. Scowen Feb. 1972 14 p refs
(NPL-NAC-13) Avail: NTIS HC $3.00

A method for writing compilers is described, along with two applications which are easily extended or altered. A conventional programming language, BABEL, and a computer program, SOAP, were used to document ALGOL 60 programs. A modular construction and the compiler in ALGOL 60 made extensions practical. Author (ESRO)

N72-24296# Army Missile Command, Redstone Arsenal, Ala.
COMPUTER EVALUATION TECHNIQUES
Donald E. Copeland 10 Jan. 1972 204 p refs
(AD-737605; RG-TR-72-3) Avail: NTIS CSCL 09/2

Problems associated with the evaluation of performance of air defense system computers are reviewed and the basis for use of digital simulation modeling in the evaluation of this class of computers is established. Decisions associated with the design of a simulation model are discussed and the design of a discrete time simulation model of an air defense computer system is described and analyzed. Specific simulation results show the proposed computer system to be satisfactory. General simulation results show the modeling structure to be well suited to air defense system evaluation. Author (GRA)

N72-24297# Office of Naval Research, London (England).
ELECTRONICS AND TELECOMMUNICATIONS AT THE UNIVERSITY OF ESSEX
I. G. Kinnie, Franklin F. Kuo, and R. O. Rowlands 4 Feb. 1972 14 p
(AD-737613; ONRL-R-2-72) Avail: NTIS CSCL 09/2

The authors present a brief review of some of the research activities in the Department of Electrical Engineering Science at Essex University, Wivenhoe Park, Colchester, England and also give a brief picture of the academic program in the Department. Author (GRA)

N72-24298# State Univ. of New York, Stony Brook. Dept. of Chemistry.
INVESTIGATION OF THE DEVELOPMENT AND IMPLEMENTATION OF MULTI-EXPERIMENT CONTROL COMPUTER SYSTEM Final Report, Sep. 1968 - Sep. 1969
Y. Okaya Oct. 1971 135 p refs
(Contract F19628-69-C-0082)
(AD-737796; AFCRL-71-0520) Avail: NTIS CSCL 09/2

The Chemistry Department of State University of New York at Stony Brook is equipped with an IBM 1800 system, a data acquisition and control computer. The computer performs simultaneous control of a number of on-line experiments in a shared-resource mode. The report starts with an introduction to the use of computers in process environments with specific reference to the concept on interrupt. The last part of the report deals with recommendations on possible multi-experiment control applications. Recommended architecture of control computers, advantages of multi-area, multi-programming executive system and role of mini-computers are the essence of the concluding section. Author (GRA)

N72-24299# Harry Diamond Labs., Washington, D.C.
MASK MAKER 1
Michael E. Conner Jan. 1972 27 p
(DA Proj. 1T0-61102-B-31A)
(AD-737670; HDL-TR-1582) Avail: NTIS CSCL 09/2

A new computer program, Mask Maker I, facilitates the drawing, or cutting, of geometric figures composed of right angles. The cut drawings are used as photomask masters in the production of integrated circuits, thick-film circuits, and printed-circuit boards. The program accepts as input, figure-command cards and dimension cards and yields a magnetic tape which, when fitted onto a modified Calcomp plotter, will cause the plotter to cut the figures specified at the input. Author (GRA)

N72-24300# RAND Corp., Santa Monica, Calif.
INTERACTIVE BIOCHEMICAL MODELING AND ANALYSIS
E. C. DeLand Sep. 1971 11 p refs
(AD-738105; P-4704) Avail: NTIS CSCL 09/2

Work was begun on a computer system which would accommodate both equilibrium and kinetic computations in the same program. It would also allow the user to write (ordinary nonlinear) differential equations and FORTRAN programs as required for the simulation of his biochemical or physiological problem. This system would therefore allow, in principle, for the iterative calculations required to simulate, for example, equilibrium in each of several compartments, and at the same time, the differential equations of mass and energy transport among compartments. This system, called BIOMOD, is now running. At this Conference a report is given on BIOMOD using a 20-minute movie to show its main characteristics. GRA

N72-24180# European Space Operations Center, Darmstadt (West Germany).
CONTROL CENTRE EQUIPMENT FOR SPACECRAFT CONTROL AND DATA PROCESSING
G. W. J. Drewes *In* ESRO Spacecraft Operations, Vol. 2 May 1971 p 101-108 (See N72-24174 15-07)
Avail: NTIS HC $9.00

09 ELECTRONIC EQUIPMENT

Includes electronic test equipment and maintainability; component parts, e.g., electron tubes, tunnel diodes, transistors; integrated circuitry; microminiaturization. For basic research see: 10 Electronics. For related information see also: 07 Communications and 21 Navigation.

N72-24301# National Defense Research Organization TNO, The Hague (Netherlands). Physics Lab.
AN APPARATUS TO CONVERT DECIMAL CODED INFORMATION INTO THE TELEPRINTER-CODE
A. W. M. VanDerVoort Oct. 1971 72 p In DUTCH; ENGLISH

summary
(PHL-1971-45; TDCK-059151) Avail: NTIS HC $5.75

An apparatus is described that converts decimal coded ballistic measurements into teletypewriter code. The input contacts of an IBM input/output writer are connected with the decimal to teletype converter. The input/output writer receives the information from a ballistic measuring system. The output of the decimal to teletype converter is connected with a Siemans parallel papertape punch. Author

N72-24302*# Sperry Rand Corp., Huntsville, Ala. Space Support Div.
RF MULTICOUPLER DESIGN TECHNIQUES TO MINIMIZE PROBLEMS OF CORONA, MULTIPACTION, AND STABILITY
Harlan S. Hurley and Dennis J. Kozakoff 31 Dec. 1971 88 p refs
(Contract NAS8-21812)
(NASA-CR-61387; SP-273-0566) Avail: NTIS HC $6.50 CSCL 09A

A mathematical expression was derived describing multipacting and corona effects in a coaxial cavity. Both mechanical and electrical design techniques were investigated to minimize the susceptibility of coaxial cavity to corona and multipacting-type breakdown. To assist in the design of a multicoupler free from corona and multipactor breakdown, a flow chart obtained from the derived mathematical expression is included. Author

N72-24303# National Defense Research Organization TNO, Rijswijk (Netherlands).
MEASUREMENT OF CHARGE DISTRIBUTION OF AEROSOLS WITH AN ELECTROSTATIC PARALLEL-PLATE AND A CYLINDER PRECIPITATOR
D. VanLeeuwen Jan. 1971 35 p refs In DUTCH; ENGLISH summary
(CL-1971-4; TDCK-58214) Avail: NTIS HC $3.75

Aerosol filters show an increased efficiency when an electrostatic charge is introduced into the filter element. This increased efficiency is related to the charge present in aerosols. The charge distribution in the aerosol can be determined with a precipitator consisting of two parallel plates or two concentric cylinders. A formula has been derived to calculate the precipitated fraction of an aerosol with a given charge as a function of the potential difference, the amount of aerosol and the dimensions of the precipitator. To obtain a charge distribution of aerosols with charges of one polarity, one of the cylinders of the precipitator was connected with an electrometer. A formula is given for the current caused by precipitated particles. These formulas are applied in the case of a DOP-aerosol. Author

N72-24304# Compagnie Francaise Thomson Houston-Hotchkiss Brandt, Paris. Lab. Central de Recherches.
MOS IMAGE READER Final Report [LECTEUR D'IMAGES A STRUCTURE MOS RAPPORT FINAL]
B. deCremoux and N. Sol 30 Sep. 1970 45 p refs In FRENCH
(Contract DGRST-69-01-821)
Avail: NTIS HC $4.25

The optimum design, production, and operation of optical image processors that use metal oxide semiconductors are reported. Work is also reported for insulation materials used in semiconductor sandwich structures. The experimental device developed to measure the characteristics of the structures is also described. The device was designed to take measurements of 10 to the 6th power image points per second, the size of the point being 50 micron. Results show that this resolution was not obtained. Theoretical results are included for the sandwich structures. Author (ESRO)

N72-24305# Army Electronics Command, Fort Monmouth, N.J.
MAGNETO-SCHOTTKY-DIODE-INTEGRATED CIRCUITS
Herbert L. Mette and E. R. Ahlstrom Jan. 1972 26 p refs
(DA Proj. 1H6-62705-A-440)
(AD-737597; ECOM-3527) Avail: NTIS CSCL 09/5

The report investigates the feasibility of using magneto-Schottky diodes for the design of various classes of digital and linear integrated circuits. The design of integratable versions of this new circuit element is presented and tentative layouts for the following typical circuits are suggested: Flip-Flops; Frequency Doubler; Unipolar Output Circuit; ac Bridge Gate Circuit; Inverter; Current Comparator; and AND/OR Gate. Author (GRA)

N72-24306# Northrop Corp., Palos Verdes Estates, Calif. Electronics Div.
DIGITAL ADDRESS THIN DISPLAY TUBE Quarterly Progress Report, 16 Jun. - 16 Sep. 1971
Lester A. Jeffries, ed. Mar. 1972 15 p refs
(Contract DAAB07-70-C-0110; DA Proj. 1H6-62705-a-055)
(AD-737754; ECOM-0110-6; QPR-6) Avail: NTIS CSCL 09/1

The report describes the progress which occurred during the sixth quarter of a Research and Development contract to develop a 32x52 resolution-element, digital address, thin display tube for use in a man-pack radar application. During this quarter a full DIGISPLAY device was tested in a bell-jar system. Performance of this device was very good. The component parts for a flat, rectangular envelope were received, and an envelope was assembled, evacuated, and pressure-tested to a differential pressure of 45 psi without breakage. A modified, thinner, low-power flood-gun was tested. The required gun output of 6 ma was obtained with a filament power of 1.8 watts.
Author (GRA)

N72-24307# Westinghouse Research Labs., Pittsburgh, Pa.
INVESTIGATION OF SILICON CARBIDE (SiC) GUN ELECTRON INDUCED SEMICONDUCTOR HYBRID AMPLIFIER (GEISHA) DIODE FEASIBILITY AND FABRICATION Biannual Report, 1 Jun. - 30 Nov. 1971
Herbert S. Berman, Terence M. Heng, and Harvey C. Nathanson 30 Dec. 1971 37 p refs
(Contract N00014-71-C-0405; NR Proj. 243-001)
(AD-737642) Avail: NTIS CSCL 09/5

Evaluation of single crystal alpha-SiC for GEISHA device application is underway. The electron carrier velocity was measured up to 8,200,000 cm/sec on 10 to the 17th power/cc uncompensated n-type crystals, with no indication of velocity saturation. The carrier saturation velocity is therefore expected to be above that of silicon. Schottky barrier diodes were fabricated on n(-)n and p(-)p SiC substrates which exhibited about half of the theoretically expected reverse blocking voltage. Soft reverse breakdown and a barrier height independent of metal layer of SiC type characterized all samples evaluated. Thin nonpenetrating ohmic contacts on SiC were developed using sputtered tungsten layers heated to 1700C after deposition. Author (GRA)

N72-24308# Aerospace Corp., El Segundo, Calif. Systems Engineering Operations.
AN EXPERIMENTAL STUDY OF A BALUN-FED, OPEN-SLEEVE DIPOLE IN FRONT OF A METALLIC REFLECTOR Research Report, Nov. 1970 - Jan. 1971
Howard E. King and Jimmy L. Wong 14 Feb. 1972 31 p refs
(Contract F04701-71-C-0172)
(AD-737554; TR-0172(2158)-3; SAMSO-TR-72-37) Avail: NTIS CSCL 09/5

The characteristics of a balun-fed, open-sleeve dipole mounted in front of a metallic reflector for operation in the 225 to 400 MHz band are investigated. A parametric study is made of the VSWR response as a function of dipole and sleeve diameter, sleeve length, and sleeve-to-dipole spacing. It is shown that an open-sleeve dipole can be operated over a bandwidth of 1.8:1 as compared with an operating bandwidth of approximately 1.25:1 for a conventional cylindrical dipole with the same diameter. Pattern and gain data are presented for an open-sleeve dipole mounted in front of a flat metallic reflector and in front of a right circular cylinder. Preliminary results of mutual impedance effects are also discussed. Author (GRA)

N72-24309# Polytechnic Inst. of Brooklyn, N.Y. Dept. of Electrophysics.
SUBMILLIMETER LOW NOISE DETECTOR AND AMPLIFIER
Final Report, 15 Feb. 1970 - 14 Feb. 1971
B. Senitzky and R. T. Kihm Jan. 1972 50 p refs
(Contract DAAB07-70-C-0140)
(AD-737755; PIBEP-71-096; ECOM-0140-F) Avail: NTIS CSCL 09/5

A 2 millimeter wavelength gas parametric amplifier using DCN15 as the active medium has been constructed and tested. Operating at room temperature, it has a measured noise figure of 25 dB. The difference between the measured value and the theoretical noise figure of 8 dB is attributed to the klystron oscillator that 'pumps' the medium. An analysis of the effect upon the amplifier's noise output of slow but large random phase fluctuations of the pump field is presented, as well as circuits to cancel this effect. In preliminary tests 8 dB of cancellation has been achieved. Author (GRA)

N72-24310# Naval Research Lab., Washington, D.C.
RF INSERTION LOSS MEASUREMENTS OF EARTH RECEIVING STATION COAXIAL NETWORK ELEMENTS
Interim Report
Stephen Nichols Feb. 1972 29 p refs
(AD-738427; NRL-MR-2390) Avail: NTIS CSCL 09/1

The insertion loss of specially developed 1 5/8 inch rigid coaxial transmission line and several passive components were predicted theoretically and confirmed by measurement, individually and as a completely assembled network for a low noise receiving system. The results show that the components have inserted losses of 0.01 dB to 0.06 dB depending on type, and a total network insertion loss of less than 0.2 dB. Comparison of calculated and measured values show the accuracy to be within three thousandths of a dB. Author (GRA)

N72-24311# Army Electronics Command, Fort Monmouth, N.J.
FIELD-EFFECT TRANSISTOR RF POWER AMPLIFIERS
Research and Development Technical Report
Martin Ringel Jul. 1971 41 p refs
(DA Proj. 1H6-62705-A-056)
(AD-737595; ECOM-3447) Avail: NTIS CSCL 09/5

The report documents the results of a series of tests devised to evaluate state-of-the-art field-effect transistors (FETs) as RF power amplifiers. Power output, gain and efficiency are studied; special attention is given to reliability and intermodulation distortion (IMD) evaluation. Conclusions drawn from the data indicate that integration of FETs in their present form into RF power amplifier designs is not feasible. Recommendations are made to modify present device designs to remove operational restrictions. Author (GRA)

N72-24312# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE QUESTION OF THE AMPLIFICATION OF A PHOTOCURRENT IN SINGLE-CRYSTAL SEMICONDUCTOR PHOTORESISTORS WITH NEUTRAL CONTACTS
G. A. Kazantsev and I. I. Taubkin 19 Nov. 1971 10 p refs Transl. into ENGLISH from the publ. "Fizika Elektronno-Dyrochnykh Perekhodov i Poluprovodnikovykh Priborov" Leningrad, Nauka, 1969 p 288-291
(AD-737890; FTD-MT-24-916-71) Avail: NTIS CSCL 09/1

The report describes the stationary distribution of photogenerated carriers and the photocurrent amplification factor for a uniform semiconductor crystal with neutral contacts with a uniform photogeneration of the electron-hole pairs with respect to volume and arbitrary value D. It is assumed that the semiconductor is extrinsic and contains levels of recombination, on which the capture cross-sections of electron and holes are different and do not depend on E. Author (GRA)

N72-24313# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
COMPENSATION OF INTERFERENCE FROM ASYMMETRY OF COAXIAL CABLES WITH THE INFLUENCE VARIABLE MAGNETIC FIELDS
Yurly Yablin 1 Dec. 1971 13 p refs Transl. into ENGLISH from Elektoprom. Priborostr. (Sofia), v. 5, no. 2, 1970 p 49-52
(AD-737875; FTD-HC-23-1251-71) Avail: NTIS CSCL 09/1

The article treats the influence of variable magnetic fields on coaxial cables. The formula determining the optimum ratios of the length of the cable, the quality of the earthing installation, and the wave resistance of the cable has been worked out. A method is demonstrated of compensating the coaxial cables with regard to the interferences at the output by means of a protection transformer. Author (GRA)

N72-24314# Army Missile Command, Redstone Arsenal, Ala.
A HOMODYNE FREQUENCY MULTIPLIER CONCEPT
Thomas A. Barley and Gustaf J. Rast, Jr. Nov. 1971 28 p refs
(DA Proj. 1M2-623-XXD-209)
(AD-738333; RE-TN-71-2) Avail: NTIS CSCL 09/5

The technical note describes experiments conducted with broadband single ended, single balanced and double balanced mixers connected through a hybrid device to allow both the Radio Frequency (RF) and Local Oscillator (LO) ports to be driven by the same signal source. Attenuators were used in both the RF and LO transmission lines to allow adjustment of signal level. No attempt was made to accomplish any phase correction of the signals at either port relative to the other port. Some advantages of this technique are discussed.
Author (GRA)

N72-24315# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CATHODIC PROCESSES AT THE CONTACT OF A METAL WITH A DIELECTRIC DURING ELECTRIC DISCHARGES
I. G. Nekrashevich and I. A. Bakuto 12 Nov. 1971 13 p refs Transl. into ENGLISH from Dokl. Akad. Nauk Belorussk. SSR (Minsk), v. 13, no. 11, 1969 p 976-979
(AD-737882; FTD-MT-24-782-71) Avail: NTIS CSCL 20/3

The article discusses cathode processes during electrical discharges through a dielectric with consideration of the role of electrons moving within the cathode material. Certain assumptions are made to simplify calculations. By means of computations, it is demonstrated that the emission of neutral atoms will depend on the properties of the cathode material, the interelectrode atmosphere and the density of the current in heavy current discharges. GRA

N72-24316# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE ELECTRICAL BREAKDOWN OF BINARY DIELECTRIC MIXTURES
I. G. Nekrashevich and I. A. Bakuto 20 Nov. 1971 14 p refs Transl. into ENGLISH from Dokl. Akad. Nauk Belorussk. SSR (Minsk), v. 11, no. 11, 1967 p 987-990
(AD-738386; FTD-MT-24-784-71) Avail: NTIS CSCL 20/3

The work gives a theoretical examination of the electrical breakdown of binary dielectric mixtures in the Townsend approach. In this case by dielectric mixture the authors imply an aggregate of molecules or atoms of two dielectric substances whose interaction is disregarded. Author (GRA)

N72-24317# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
LINEAR INTEGRATED CIRCUITS TELSA MBA 225,245
Ivan Stehno 7 Dec. 1971 11 p ref Transl. into ENGLISH from Sdelovaci Tech. (Czechoslovakia), v. 18, no. 3/4, 1970 p 73-75
(Contract F33657-71-D-0057)
(AD-738229; FTD-HC-23-393-71) Avail: NTIS CSCL 09/5

The system MBA 225,245 is formed by combining two linear integrated circuits MAA 125,145. The system has approximately the same parameters as LIC MAA 125,145, and both channels have the same parameters. The number of

elements is thus reduced while the minimal crosstalk level is maintained. Author (GRA)

N72-24259# Israel Program for Scientific Translations, Ltd., Jerusalem.
AUTOMATED INVESTIGATION OF THE CHARACTERISTICS OF A THIN FILM SWITCHING ELEMENT
S. I. Konyaev and N. F. Sychev *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 81-86 ref (See N72-24251 15-08)
Avail: NTIS HC $17.00

10 ELECTRONICS

Includes circuit theory; and feedback and control theory. For applications see: 09 Electronic Equipment. For related information see specific Physics categories.

N72-24318*# Massachusetts Inst. of Tech., Cambridge. Dept. of Aeronautics and Astronautics.
APPLICATION OF CONTRACTION MAPPINGS TO THE CONTROL OF NONLINEAR SYSTEMS Ph.D. Thesis
William Robert Killingsworth, Jr. Jan. 1972 187 p refs
(Grants NGR-22-009-010; NGR-22-009-270)
(NASA-CR-126626; TE-49) Avail: NTIS HC $11.50 CSCL 09C

The theoretical and applied aspects of successive approximation techniques are considered for the determination of controls for nonlinear dynamical systems. Particular emphasis is placed upon the methods of contraction mappings and modified contraction mappings. It is shown that application of the Pontryagin principle to the optimal nonlinear regulator problem results in necessary conditions for optimality in the form of a two point boundary value problem (TPBVP). The TPBVP is represented by an operator equation and functional analytic results on the iterative solution of operator equations are applied. The general convergence theorems are translated and applied to those operators arising from the optimal regulation of nonlinear systems. It is shown that simply structured matrices and similarity transformations may be used to facilitate the calculation of the matrix Green functions and the evaluation of the convergence criteria. A controllability theory based on the integral representation of TPBVP's, the implicit function theorem, and contraction mappings is developed for nonlinear dynamical systems. Contraction mappings are theoretically and practically applied to a nonlinear control problem with bounded input control and the Lipschitz norm is used to prove convergence for the nondifferentiable operator. A dynamic model representing community drug usage is developed and the contraction mappings method is used to study the optimal regulation of the nonlinear system. Author

N72-24319# National Defense Research Organization TNO, The Hague (Netherlands). Physics Lab.
TIME DOMAIN REFLECTOMETRY APPLIED TO THE STUDY OF DIELECTRIC RELAXATION PHENOMENA IN POLAR LIQUIDS. PART 1: THEORY
M. J. C. VanGemert Jun. 1971 80 p refs
(PHL-1971-29; TDCK-58982) -Avail: NTIS HC $6.00

After an introduction in transmission line theory and linear response theory, the reflection behavior of a transmission line partly filled with a polar dielectric, is calculated in the time domain, applying a heaviside step (zero risetime) to a dielectric sample of infinite length (no multiple reflections). The main conclusion is that it is impossible to determine the dielectric relaxation time directly in the time domain because the type of dielectric model involved cannot be recognized from the shape of the TDR signal. Author

N72-24320*# Bendix Corp., Davenport, Iowa. Instruments and Life Support Div.
RF QUANTITY GAUGING SYSTEM Summary Report
23 Mar. 1972 13 p refs
(Contract NAS9-12450)
(NASA-CR-115584; PUB-4918-72) Avail: NTIS HC $3.00 CSCL 09C

The modifications, calibration, and tests of the RF liquid mass gaging system, Benedix Type X1625027, are given. Also given are test methods, test results, and optimum performance of the system. Author

N72-24321*# Electro-Optical Systems, Inc., Pasadena, Calif.
ADVANCED POWER CONDITIONING SYSTEM
N. L. Johnson 11 Nov. 1971 138 p Sponsored by NASA
(Contract JPL-953097)
(NASA-CR-126641; EOS-4064-FR1) Avail: NTIS HC $9.00 CSCL 09C

The second portion of the advanced power conditioning system development program is reported. Five 100-watt parallel power stages with majority-vote-logic feedback-regulator were breadboarded and tested to the design goals. The input voltage range was 22.1 to 57.4 volts at loads from zero to 500 watts. The maximum input ripple current was 200 mA pk-pk (not including spikes) at 511 watts load; the output voltage was 56V dc with a maximum change of 0.89 volts for all variations of line, load, and temperature; the maximum output ripple was 320 mV pk-pk at 512 watts load (dependent on filter capacitance value); the maximum efficiency was 93.9% at 212 watts and 50V dc input; the minimum efficiency was 87.2% at 80-watt load and 50V dc input; the efficiency was above 90% from 102 watts to 372 watts; the maximum excursion for an 80-watt load change was 2.1 volts with a recovery time of 7 milliseconds; and the unit performed within regulation limits from -20 C to +85 C. During the test sequence, margin tests and failure mode tests were run with no resulting degradation in performance. Author

N72-24322# Joint Publications Research Service, Arlington, Va.
CYBERNETICS AND REGULATION THEORY
18 Apr. 1972 25 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 202, no. 1, 1972 p 54-61, 298-299, and 522-525
(JPRS-55742) Avail: NTIS HC $3.25

Selected Soviet articles are presented on: (1) submodel similarity ratios and design of individual indirect experiments; (2) generalization of the theory of error accumulation; (3) optimal control in hierarchical structures; (4) machine organization of a growing search tree; and (5) nonlinear differential game of evasion. For individual titles, see N72-24323 through N72-24327.

N72-24323# Joint Publications Research Service, Arlington, Va.
SUBMODEL SIMILARITY RATIOS AND DESIGN OF INDIVIDUAL INDIRECT EXPERIMENTS
Yu. V. Burkin *In its* Cybernetics and Regulation Theory 18 Apr. 1972 p 1-4 refs (See N72-24322 15-10)
Avail: NTIS HC $3.25

Programming of indirect isolated experiments on the basis of similarity ratios that are weaker than the modeling ratios was examined. Unlike the case of reaching the modeling ratio when the indirect experiment is totally adequate regardless of the form of comparing the entities, in the case of imitation ratios the inadequacy of the indirect experiment depends on the choice of metrics, imitator, and the sense of the comparison. Therefore in designing isolated indirect experiments under similarity conditions, which are poorer than the modeling conditions, a certain sense of the problem was found on optimizing the metrics, entity, and sense of the experiments. It was clear that in the general case these conditions may be found only in combination. A.L.

N72-24324# Joint Publications Research Service, Arlington, Va.
GENERALIZATION OF THE THEORY OF ERROR ACCUMULATION
G. M. Ulanov and I. Ya. Krichevskiy *In its* Cybernetics and Regulation Theory 18 Apr. 1972 p 5-9 refs (See N72-24322 15-10)
Avail: NTIS HC $3.25

The determination of conditions for accumulating errors and the evaluation of maximal dynamic error of the system for a finite segment of time under perturbing effects, limited in absolute value along with its first two derivatives, and the relationship of this problem to the theory of optimal processes have been investigated. The theorems applicable to the solution are described and discussed. A.L.

N72-24325# Joint Publications Research Service, Arlington, Va.
OPTIMAL CONTROL IN HIERARCHICAL STRUCTURES
Yu. M. Fatkin *In its* Cybernetics and Regulation Theory 18 Apr. 1972 p 10-14 (See N72-24322 15-10)
Avail: NTIS HC $3.25

An analysis is presented of the control of a dynamic system represented in the form of a hierarchical structure. The dynamic system was described by ordinary differential equations with a common functional. The formalism of developments on the basis of Pontryagin's principle of the maximum was used for proof of the theorem. A.L.

N72-24326# Joint Publications Research Service, Arlington, Va.
MACHINE ORGANIZATION OF A GROWING SEARCH TREE
S. Ya. Berkovich *In its* Cybernetics and Regulation Theory 18 Apr. 1972 p 15-17 refs (See N72-24322 15-10)
Avail: NTIS HC $3.25

The construction of list structures in large information systems involves difficulties in effectively organizing the exchange between file and main memory. A method of organizing a growing search tree which ensures simple logics of construction and of the growing system is suggested. In this method the editing required is only of a local nature. Practically no limitations are imposed on the structure of the system and the inquiry is processed with only one memory access. The method is convenient when any type of file is used, however, it is most efficient for memories with cyclical access. In such a case the possibility of processing the inquiry with a single access virtually guarantees minimal search time. A.L.

N72-24327# Joint Publications Research Service, Arlington, Va.
NONLINEAR DIFFERENTIAL GAME OF EVASION c19
V. N. Lagunov *In its* Cybernetics and Regulation Theory 18 Apr. 1972 p 18-23 refs (See N72-24322 15-10)
Avail: NTIS HC $3.25

The results of a nonlinear differential game of evasion have been determined with the assistance of a certain extrapolation construction. The differential game is defined and the theorems and proofs are described. A.L.

N72-24328*# Massachusetts Inst. of Tech., Cambridge. Electronic Systems Lab.
ON STOCHASTIC CONTROL AND OPTIMAL MEASUREMENT STRATEGIES Ph.D. Thesis
Leslie C. Kramer Nov. 1971 254 p refs
(Grants NGL-22-009-124; AF-AFOSR-1941-70; DSR Proj. 76265; DSR Proj. 72486)
(NASA-CR-126547; ESL-R-462) Avail: NTIS HC $14.75 CSCL 09D

The meaning of stochastic optimality and the means by which dynamic programming may be applied to solve a combined control/measurement problem is discussed. A technique is described by which it is possible to apply deterministic methods, specifically the minimum principle, to the study of stochastic problems. The methods are applied to linear systems with Gaussian disturbances to study the structure of the resulting control system. A useful separation property is shown to hold for linear systems with quadratic cost criteria and Gaussian noise. Author

N72-24329# National Defense Research Organization TNO, Rijswijk (Netherlands).
ELECTRETFILTERS. 5: PROPERTIES AND APPLICATIONS
R. M. Lie Aug. 1971 32 p refs In DUTCH; ENGLISH summary
(CL-1971-23; TDCK-59034) Avail: NTIS HC $3.75

To achieve a practical applicable electric filter some filtration parameters were studied. It appeared that the particle size as well as the linear velocity of the aerosol have a large influence on the penetration. The influence of aerosol concentration and relative humidity was limited. The behaviour of the filters towards different aerosols was also studied. It appeared that electric filters are in particular suited as dust filters. To develop a more favourable penetration-loading characteristic a filter composed of several thin electrified layers was tested. The possibilities of regeneration of used filters were studied. Only filters loaded with liquid aerosols could be restored in their original state by washing and again electrifying. It was found that the filters remain in an electrified state for at least one year when they are stored in an air-tight container. Author

N72-24330# Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires.
CALCULATION OF THE RELATION BETWEEN THE INPUT AND OUTPUT AMPLITUDE FOR RANDOM PULSES AND THE CIRCUIT PULSE RESPONSE IN ORDER TO DETERMINE THE MEASUREMENTS TO BE MADE ON LINEAR CIRCUITS AND THE GENERATOR STABILITY REQUIRED [CALCUL, POUR DES IMPULSIONS ALEATOIRES, DES RELATIONS LIANT LES DISTRIBUTIONS DES AMPLITUDES D'ENTREE, DE SORTIE ET LA REPONSE IMPULSIONNELLE D'UN CIRCUIT EN VUE DE DETERMINER LES MESURES A EFFECTUER SUR LES CIRCUITS LINEAIRES ET LA STABILITE DU GENERATEUR A UTILISER]
Claude Jollec, Joseph Kermorgant, and Claude Ringeard Sep. 1971 45 p refs In FRENCH
(CEA-R-4236) Avail: AEC Depository Libraries

The effect of the average pulse rate and amplitude variations at the output of a linear circuit with an impulse response h(t) is evaluated. Calculations are made for two filters: (1) Cr differentiation and n RC integrations; and (2) CR differentiations and n RC integrations. The amplitude and the average pulse rate stability are deduced for a generator designed to simulate a radioactive source, used for measuring the characteristics of linear circuits in the presence of random pulses. This leads to the definition of the parameters to be measured and the measurements to be made. Some experimental results are presented. Author (NSA)

N72-24331# Office of Naval Research, London (England).
EUROCON 1971
I. G. Kinnie and Franklin F. Kuo 31 Jan. 1972 10 p Conf. held at Lausanne, Switzerland, 18-22 Oct. 1971
(AD-737610; ONRL-C-72) Avail: NTIS CSCL 14/2

EUROCON 71 was held in Lausanne, Switzerland in October 1971. The report discusses a number of the papers presented at the Congress. GRA

N72-24332# Boeing Co., Seattle, Wash. Aerospace Group.
INVESTIGATION OF ION BEAM TECHNIQUES FOR MICROELECTRONICS Final Report, 18 Apr. 1970 - 20 Aug. 1971
William B. Shepherd 30 Sep. 1971 75 p refs
(Contract N00019-70-C-0478)
(AD-737668; D180-14292-1) Avail: NTIS CSCL 11/3

Continued studies related to the use of low energy ion deposition for application to microelectronics are discussed. The

reactive deposition of Cu(-) ions in O2, H2S and H2O ambients was investigated to determine the role of ion energy in promoting or altering the reaction between the ions and gases at a substrate surface. An apparent reaction was observed between Cu(-) and O2 or H2S, but not with H2O. The reactions were dependent upon the ion energy. Measurements of the optical and physical properties of the resultant films showed them to be substantially metallic in spite of considerable gas absorption during deposition. Results of measurements of the sorption of energetic Au ions by thin SiO2 surfaces are reported.
Author (GRA)

N72-24333# Army Foreign Science and Technology Center, Charlottesville, Va.
USE OF INTEGRAL EQUATIONS FOR CALCULATION OF PERIODIC MODES IN NONLINEAR CIRCUITS
E. A. Karpov 1972 10 p refs Transl. into ENGLISH from Teor. Elektrotekhn. (USSR), no. 5, 1968 p 108-112
(AD-737966; FSTC-HT-23-381-72) Avail: NTIS CSCL 09/5

Calculations involving an electrical circuit with one nonlinear element are discussed with piece-linear approximation of the characteristic of this element. The calculation is based on the works of Ye. N. Rozenvasser, dedicated to the application of integral equations for analysis of nonlinear systems.
Author (GRA)

N72-24265# Israel Program for Scientific Translations, Ltd., Jerusalem.
AN ADAPTIVE SERVOSYSTEM WITH DIGITAL CONTROL UNIT
V. A. Alekseev *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 114-123 refs (See N72-24251 15-08)
Avail: NTIS HC $17.00

11 FACILITIES, RESEARCH AND SUPPORT

Includes airports; lunar and planetary bases including associated vehicles; ground support systems; related logistics; simulators; test facilities (e.g., rocket engine test stands, shock tubes, and wind tunnels); test ranges; and tracking stations.

N72-24334*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ENVIRONMENTAL SIMULATION FROM 0.01 TO 100 SOLAR CONSTANTS
John R. Jack and Ernie W. Spisz 1972 16 p refs Presented at 6th Space Simulation Conf., New York, 1-4 May 1972; sponsored by Inst. of Environ. Sci., AIAA, and Am. Soc. for Testing and Mater.
(NASA-TM-X-68048; E-6888) Avail: NTIS HC $3.00 CSCL 14B

The design and development of two solar radiation simulators with an intensity variation ranging from 0.01 to greater than 100 solar constants under vacuum conditions are discussed. The characteristics of the simulators are presented in terms of spectral content, beam uniformity, and stability. Preliminary thermal radiative property data obtained at high temperatures are reported. The general operating characteristics of the simulator are automatic starting, control of both positive and negative electrodes, and uninterrupted operation for periods in excess of 24 hours.
Author

N72-24335*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
INITIAL OPERATING EXPERIENCE WITH AN AIRCRAFT SIMULATOR HAVING EXTENSIVE LATERAL MOTION
Richard S. Bray May 1972 27 p refs
(NASA-TM-X-62155) Avail: NTIS HC $3.50 CSCL 14B

The flight simulation facility features an extensive cockpit motion system, emphasizing lateral motion for the simulation of lateral-directional control tasks. The motion capabilities of the simulator are briefly described, and the logic with which the motion drives are controlled to provide the most effective approximations of the motions of flight is discussed. Preliminary assessments of the effectiveness of these motions, in the simulation of large transport aircraft, are discussed.
Author

N72-24336# Committee on Science and Astronautics (U. S. House).
NASA VISITOR INFORMATION FACILITIES
Washington GPO Oct. 1971 19 p Presented to Comm. on Sci. and Astronaut., 92d Congr., 1st Sess., 4 Oct. 1971
Avail: Subcomm. on NASA Oversight

Problems associated with providing facilities for accommodating visitors at NASA centers, the facilities now available, and recent and planned increases in information and facilities available to the public are reported. The numbers of visitors at each center, the manner of accommodating them, the type of tours, and points of interest and exhibits are given. This emphasis is on the John F. Kennedy Space Center, its Visitors Information Center, and the planning being undertaken to improve the facilities.
N.E.N.

N72-24337# Committee on Interstate and Foreign Commerce (U. S. House).
AIRPORT AND AIRWAY TRUST FUND
Washington GPO 1971 118 p refs Hearings on H.R. 7072 (and identical bills) before Comm. on Interstate and Foreign Com., 92d Congr., 1st Sess., 8-9 Jun. 1971
Avail: NTIS Avail: Subcomm. on Transportation and Aeronautics

Amendments to the Airport and Airway Development and Revenue Acts are considered in order to clarify priorities such as modernization and expansion.
G.G.

N72-24338# Federal Aviation Administration, Washington, D.C.
SITING CRITERIA FOR INSTRUMENT LANDING SYSTEMS
7 Jun. 1971 182 p
(DOT-FAA-6750.16) Avail: NTIS HC $11.25

Criteria for the installation of instrument landing systems are presented. The choice of the runway to be served is based on the following factors: (1) runway length and width, (2) compliance with minimum obstruction clearance regulations, (3) alignment with respect to the prevailing low visibility wind, (4) orientation with respect to the traffic approaches of the airport and the airways concerned, and (5) missed approach procedure. The effects of siting on the operation of the instrument landing system are examined. Typical instrument landing system installations are illustrated.
Author

N72-24339*# General Electric Co., Syracuse, N.Y. Electronics Lab.
REMOTE MANIPULATOR DYNAMIC SIMULATION Final Report
E. C. Wild, P. K. Donges, and W. A. Garand Apr. 1972 69 p
(Contract NAS9-11948)
(NASA-CR-115636) Avail: NTIS HC $5.50 CSCL 14B

A simulator to generate the real time visual scenes required to perform man in the loop investigations of remote manipulator application and design concepts for the space shuttle is described. The simulated remote manipulator consists of a computed display system that uses a digital computer, the electronic scene generator, an operator's station, and associated interface hardware. A description of the capabilities of the implemented simulation is presented. The mathematical models and programs developed for the simulation are included.
Author

N72-24340# Royal Aircraft Establishment, Farnborough (England).
THE ISL BANG GENERATOR
C. Thery, A. Peter, and F. Schlosser Dec. 1971 46 p refs Transl. into ENGLISH from "Le Generateur de Bang de l'ISL", Inst. Franco-Allemand de Rech., St. Louis, France, report ISL-T-15/71
(RAE-Lib-Trans-1629; BR29128; ISL-T-15/71) Avail: NTIS $4.50

The main characteristics of the bang generator, constructed at ISL, are given. This generator is designed to produce bangs of the same characteristic shape and duration as those due to supersonic aircraft and with an equal or slightly higher intensity. The bang generator is a shock tube 189 square meters long of which the driving section is made of steel and the expansion tube of concrete. An experimental section, 2.5 x 2.5 square meters in cross-section, allows research into the physiological or structural action of a bang to be carrried out. This part of the simulator is housed in a measurement building. An animal laboratory has been set-up 50 meters away from there. The performance of the generator is as planned, with N-waves having durations of the order of 300 and 100 msec and with intensities which can be controlled between 0.5 and 50 millibars. The forward and rear compression fronts of the wave are well-formed for wave intensities greater than 4 millibars and are of more gradual growth for the weakest waves. The return-wave absorber operates correctly. Author

N72-24341# Aeronautical Research Labs., Melbourne (Australia).
A PRESSURE MEASURING SYSTEM FOR THE ARL TRANSONIC WIND TUNNEL
G. R. Kittson and J. B. Willis Nov. 1971 25 p ref
(ARL/A.333) Avail: NTIS HC $3.25

Equipment for the measurement of pressures on models and test section walls in a transonic wind tunnel is described. The equipment provides stagger scanning of up to five pressure scanning valves (up to 240 pressure tappings). The scanning rate is preset, and is variable up to a maximum of 10 readings per second. Output is to a digital printer at up to 360 characters per second, and/or to a high speed paper tape punch at 120 characters per second. Preset automatic end of scan and automatic homing of all scanning valves is incorporated to eliminate spurious readings which would otherwise be recorded. Provision for the repetitive insertion of other data after a preset number of readings is also incorporated, the scan being automatically inhibited while this occurs. Author

N72-24342# Aeronautical Research Labs., Melbourne (Australia).
INSTRUMENTATION OF AN AUTOMATIC SIX COMPONENT BALANCE FOR A SUBSONIC WIND TUNNEL
J. F. Harvey and C. W. Sutton Jul. 1971 47 p refs
(ARL/I.75) Avail: NTIS HC $4.50

Instrumentation which automatically controls the balancing of the six component balance for a subsonic wind tunnel is described. The balance simultaneously measures three forces and three moments which act on a model mounted in the air flow of the tunnel. Author

N72-24343# Tokyo Univ. (Japan). Inst. of Space and Aeronautical Science.
A FREE-FLIGHT SUPPORT SYSTEM
Akira Azuma, Bunji Tomita (Natl. Space Develop. Agency of Japan), Matsusaburo Iuchi, Hideo Mishima (Shimadzu Seisakusho Ltd.), Tadami Iwata (Shimadzu Seisakusho Ltd.), and Akira Komoto (Shimadzu Seisakusho Ltd.) Mar. 1972 36 p refs
(ISAS-477-Vol-37-No-3) Avail: NTIS HC $4.00

A support system for a free flight test facility to simulate V/STOL and helicopter flight is discussed. The system consists of a free flight follower and a data reduction system. The flight path and attitude angles of the model during flight are sensed with potentiometers and recorded in oscillograms. A miniature computer and an analog to digital converter are included as part of the support system. Author

N72-24344# Tokyo Univ. (Japan). Inst. of Space and Aeronautical Science.
DETERMINATION OF NOISE EXPOSURE AROUND AN AIRPORT
Juichi Igarashi and Gen Nishinomiya (Japan Broadcasting Corp.) Mar. 1972 18 p refs
(ISAS-476-Vol-37-No-2) Avail: NTIS HC $3.00

A study of drawing the noise exposure contour around an airport is presented. The contour was figured out from measured data obtained in the vicinity of Osaka airport. It is compared with the calculated contour based on data of FAA, the specified flight paths and scheduled operations similar to those of the period of measurements. The methods of determination of PNdb, duration and tone corrections are also mentioned together with the relation between PNdb and db(D) or db(A). Author

N72-24345# Paris Univ., Orsay (France). Inst. de Physique Nucleaire.
LONG-LIFE, HEAT-PIPE-HEATED, CHARGE-TRANSFER CELL
M. Bacal, N. Olier, and W. Reichelt (Comm. a l'Energie Atomique, Saclay, France) [1971] 2 p Presented at Symp. on Ion Sources and Formation of Ion Beams, Upton, N. Y., 19-21 Oct. 1971
(Conf-711012-13) Avail: AEC Depository Libraries

A lithium charge exchange chamber for the production of negative helium ions for tandem accelerators is described. An annular cesium-filled heat pipe is used to maintain the desired high temperature. Results from the first-run operation are given. NSA

N72-24346# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
DIGITIZED PROTON RANGE SPARK CHAMBER BETWEEN 60 AND 150 MeV
R. Giordano, G. Grisanti, and P. Salvadori 16 Jul. 1971 62 p refs In ITALIAN
(ISS-71/15) Avail: AEC Depository Libraries

A multiplate range spark chamber for protons is described. The digitizing system and the particular criteria adopted for track reconstruction are outlined. Preliminary results with cosmic rays were obtained using an automatic data acquisition system by means of an on-line IBM 1800 computer. Author (NSA)

N72-24347# Oak Ridge National Lab., Tenn.
SAFETY ANALYSIS OF SOLID STATE DIVISION 2.5 MV ELECTRON ACCELERATOR
O. E. Schow Jan. 1972 11 p ref
(Contract W-7405-eng-26)
(ORNL-TM-3680) Avail: NTIS

The Van de Graaff accelerator stop switches, protective door interlock switches, accelerator keys, belt drive motor system, visual and audible alarms, radiation instruments, startup alarms, emergency lights, and radiation shielding are described. Also, other hazards including the high pressure accelerator tank, high vacuum equipment, fire safety, electrical safety, ozone, and the tv camera system are discussed. NSA

N72-24348# Sandia Labs., Albuquerque, N.Mex.
MINICOMPUTER CONTROL AND MEASUREMENT SYSTEM FOR A HIGH ACCURACY PROGRAMMABLE CENTRIFUGE
D. M. Darsey Jan. 1972 52 p
(SC-DR-710644) Avail: NTIS

Development of a high accuracy centrifuge which can be used for both steady state and programmed radial acceleration applications was initiated. Specifications were prepared for a centrifuge and power supply capable of static radial acceleration levels from 1 to 125 g plus or minus 0.01% or 0.001 g in either direction, programmable through zero, and capable of programming any existing reentry profile. The centrifuge will carry a 10-pound test component at a 24-inch programming

radius or a 50-pound component at a 36-inch steady-state radius, and operate over a temperature range of -100 F to +200 F. The centrifuge servo control will accept an external analog voltage and produce a proportional angular velocity within 0.1% for programming. A series of three vernier potentiometers provide manual control. Author

N72-24349# Centre National de la Recherche Scientifique, Marseilles (France). Lab. d'Astronomie Spatiale.
[ACTIVITIES OF THE SPACE ASTRONOMY LABORATORY] [LE LABORATOIRE D'ASTRONOMIE SPATIALE DU CNRS]
29 Apr. 1971 36 p In FRENCH
(Rept-01-71) Avail: NTIS HC $4.00

The development of the laboratory is described and the work carried out during the last four years is reviewed. The laboratory has specialized in the design of optical experiments, ultraviolet photography of the sky and especially the Milky Way and the Andromeda galaxy (M31). Results gained through interpretation of these photographs are discussed.
Author (ESRO)

N72-24350# Institut Franco-Allemand de Recherches, St. Louis (France).
DEVELOPMENT AND TESTING OF HIGH PRESSURE MEMBRANES FOR THE ISL 20mm LIGHT GAS GUN [ETUDE ET MISE AU POINT DE MEMBRANES HAUTE PRESSION POUR LE CANON A GAZ LEGER DE 20mm DE L'ISL]
J. P. Hancy, R. Haeusel, and H. Jay 7 Sep. 1970 25 p refs In FRENCH
(ISL-13/70) Avail: NTIS HC $3.25

Some metallic membranes were examined in an investigation of the impact on the launch tube wall of metallic particles detached from membranes during the passage of the gas through apertures. Performance tests were carried out on conical and flat slotted membranes to determine the influence of aperture pressure on the gun performance taking into account factors such as the shape, depth of slots, etc. Author (ESRO)

N72-24351# Rome Univ. (Italy). Inst. of Physics.
USE OF FLASH-TUBE HODOSCOPE CHAMBERS WITH PARTICLE ACCELERATORS
M. Conversi, G. Giannoli, and P. Spillantini (CNEN, Frascati, Italy) 7 Jan. 1972 15 p refs Submitted for publication
(Nota-Interna-353) Avail: NTIS HC $3.00

The applicability of hodoscope chamber technique with electrodeless flash tubes to experiments with particle acceleration has been investigated with the help of the muons pions group at ADONE storage ring. The performance of the flashtube of 2 cm diameter was investigated in the presence of an installation comprising three hodoscope chambers at different distances from a vacuum chamber. These chambers, as well as the spark chambers, were triggered on the occurrence of two types of events: single track events due to cosmic ray muons unrejected by electronics, and multitrack events due to development of electromagnetic showers associated with wide angle electron positron elastic scattering. Author (ESRO)

N72-24352# Federal Aviation Administration, Washington, D.C.
OPERATIONS UNDER THE AIRPORT AND AIRWAY DEVELOPMENT ACT Annual Report, fiscal year ending 30 Jun. 1971
30 Jun. 1971 46 p
(AD-737040; AR-2) Avail: NTIS CSCL 01/5

The Airports Program is based primarily on the provisions of the Airport and Airway Development Act of 1970 (Public Law 91-258) enacted on 21 May 1970. Principal activities of this program include preparation of a National Airport System Plan, administering programs of grants-in-aid for airport planning and airport development; development and application of airport planning, engineering and safety standards; airport certification and inspection for safety of operations; field collection of information for the airport data program; participation in transfer of Federal land and property for civil airport use; and the program for assuring compliance and enforcement of airport agreements. Author (GRA)

N72-24353# Office of Naval Research, London (England).
EUROPEAN SCIENTIFIC NOTES, VOLUME 26, NUMBER 1
Seymour Hess and Victoria Hewitson 31 Jan. 1972 31 p refs
(AD-737607; ONRL-26-1) Avail: NTIS CSCL 14/2

The report is a monthly publication presenting brief articles concerning recent developments in European scientific research. It is hoped that these articles (which do not constitute part of the scientific literature) may prove of value to American scientists by disclosing interesting information well in advance of the usual scientific publications. The articles are written by members of the scientific staff of ONRL, with an occasional article contributed by a visiting stateside scientist. Author (GRA)

N72-24354# Terra-Space, Inc., Bethesda, Md.
ROCK DISINTEGRATION BY PULSED LIQUID JETS Annual Report, Jan. 1971 - Jan. 1972
William C. Cooley and Paul E. Brockert Jan. 1972 43 p refs
(Contract DI-H021002; ARPA Order 1579)
(AD-737621; TR-4032) Avail: NTIS CSCL 14/2

Experiments are reported on the breakage of granite, limestone and sandstone by pulsed water jets using a Voitsekhovsky-type cumulation nozzle with jet velocities up to 1800 m/sec, a jet diameter of 0.716 cm, and piston impact energies up to 65,000 Joules. Data on the specific energy for single pulse spall craters in the face of 30 cm cubic rock samples is plotted against the specific pressure (the ratio of jet stagnation pressure to rock compressive strength). The specific energy decreases rapidly as the jet stagnation pressure is increased from 1.43 to 3.95 times the compressive strength.
Author (GRA)

N72-24355# Chicago Univ., Ill. Fluid Dynamics and Sediment Transport Lab.
EXPERIMENTAL SYSTEM FOR THE ANALYSIS OF CONTINUOUSLY TRANSFORMING IMPULSE WAVES
Robert V. White and Robert L. Miller Jun. 1971 59 p refs
(Contract N00014-67-A-0285-0013)
(AD-738165; TR-10) Avail: NTIS CSCL 14/2

The technical report is intended to serve as a companion to Technical Report No. 11, Miller, 1971, Impulse Waves, Transitions and Ultimate Stable Form. The general system design includes the sensing and recording of the impulse generator parameters, the wave amplitudes and velocity and the wave surface profile. Integration of the volume under a wave is accomplished by using operational amplifiers. Details of the capacitance probe structure is included and calibration curves are given where applicable.
Author (GRA)

N72-24356# Naval Ordnance Lab., White Oak, Md.
DISSIPATION OF AN AXIALLY SYMMETRIC TURBULENT WAKE IN THE VERY FAR FIELD
Robert H. Waser 27 Dec. 1971 19 p refs
(AD-737996; NOLTR-72-26) Avail: NTIS CSCL 14/2

A wake visualization technique has been used to observe turbulent wake at distances of 1000000 diameters behind an axially symmetric streamlined body traveling submerged in water. It has been found that a reverse transition occurs in the rate of wake growth between 10000 and 1000000 diameters, which is attributed to a reverse transition from turbulent to laminar flow. The wake visualization technique involves dropping a dye-coated body down a taut, vertical guide wire into a large water-filled tank. Measurement of the wake growth and dissipation is made from a time series of photographs. The bodies tested were 6 x 1 prolate spheroids of two sizes. Body density was varied to change velocities. GRA

N72-24357# Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
TOTAL IN-FLIGHT SIMULATOR (TIFS), PRELIMINARY DESIGN REPORT Final Report, Nov. 1966 - Jun. 1967
Wright-Patterson AFB, Ohio AFFDL Aug. 1971 262 p refs
(Contract F33615-67-C-1157; AF Proj. 684B)
(AD-738314; AFFDL-TR-71-119) Avail: NTIS CSCL 14/2

The TIFS research airplane, the most advanced in-flight simulation vehicle yet developed, was designed to provide Total In-Flight Simulation. This capability depends on two basic features of the aircraft. First is the addition of an evaluation cockpit which is entirely separate from the normal airplane's safety pilot's cockpit. Second is the control by a variable stability system of not only the moments about all three axes, but also the forces acting along the three axes. The report describes the TIFS airplane development during the period from November 1966 to June 1967. Author (GRA)

N72-24176# European Space Operations Center, Darmstadt (West Germany).
BACKGROUND OF THE ESTRACK COMMUNICATIONS NETWORK
M. W. Haydock *In* ESRO Spacecraft Operations, Vol. 2 May 1971 p 35-38 (See N72-24174 15-07)
Avail: NTIS HC $9.00

12 FLUID MECHANICS

Includes boundary-layer flow; compressible flow; gas dynamics; hydrodynamics; and turbulence. For related information see also: 01 Aerodynamics; and 33 Thermodynamics and Combustion.

N72-24358 California Inst. of Tech., Pasadena.
ELECTRON BEAM MEASUREMENTS OF THE SHOCK WAVE STRUCTURE. PART 1: DETERMINATION OF THE INTERACTION POTENTIAL OF THE NOBLE GASES FROM SHOCK WAVE STRUCTURE EXPERIMENTS PART 2: FEASIBILITY OF A MODIFIED ELECTRON BEAM DENSITOMETER TECHNIQUE TO MEASURE DIFFUSIVE SEPARATION IN SHOCK WAVES IN HELIUM-ARGON MIXTURES Ph.D. Thesis
Brian Thomas Barcelo 1971 159 p
Avail: Univ. Microfilms Order No 71-21896

Shock wave experiments were conducted in a seventeen-inch low density shock tube to measure the interaction potential of the following nonradioactive noble gases: neon, argon, krypton, and xenon. The experimental shock profiles obtained by employing the electron beam densitometer technique were compared to the Monte Carlo numerical simulation of the shock wave structure. The intermolecular potential was determined for these gases, and the values resulting for the free parameter s in the inverse repulsive power law were found to be 9, 10, 11, and 12 for xenon, krypton, argon, and neon, respectively. The feasibility of a modified electron beam densitometer technique was investigated for measuring the shock wave structure in a binary mixture of helium and argon. Dissert. Abstr.

N72-24359 Stanford Univ., Calif.
AN ANALYSIS OF A TWO-DIMENSIONAL PROPULSION WING Ph.D. Thesis
Galen Hu 1971 120 p
Avail: Univ. Microfilms Order No. 71-23518

A numerical method of solution using distributed surface singularities was developed to solve the potential flow problem of a two-dimensional airfoil with distributed suction over part of its upper surface and a thin jet issuing from a general point of the lower surface. The fluid at the trailing edge is assumed to separate as a free streamline forming a constant pressure wake region between it and the jet. The shapes of the free streamline and the jet, a prior unknown, constitute part of the solution. Several cases were calculated for different jet strengths with or without suction. The agreement of the numerical results with some limited experimental data with a jet, but no suction, is fair. This might be partly attributed to leading edge separation observed during the experiment. Dissert. Abstr.

N72-24360# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Freiburg (West Germany). Inst. fuer Angewandte Mathematik und Mechanik.
MATHEMATICAL TREATMENT OF A FLOWING MIXTURE OF DIATOMIC MOLECULES AND ATOMS UNDER CONSIDERATION OF THE RELAXATION OF THE DEGREES OF FREEDOM OF ROTATION AND VIBRATION, OF CHEMICAL REACTIONS, AND OF TRANSPORT PHENOMENA
L. Wassner 19 Oct. 1971 140 p refs In GERMAN; ENGLISH summary
(DLR-FB-71-81) Avail: NTIS HC $9.00; DFVLR, Porz: 31, 90 DM

Calculation of the local state of an initially diatomic gas in a shock front and in its wake requires accounting for both relaxation of the inner degrees of freedom of the molecules and for chemical reactions. Differential equations are discussed here which govern such flows of gaseous mixtures, consisting of diatomic molecules and atoms, with relaxation, chemical reactions, and transport processes (due to viscosity, diffusion, thermal diffusion, and thermal conductivity). Author

N72-24361# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Aachen (West Germany). Inst. fuer Theoretische Gasdynamik.
APPROXIMATE ANALYSIS OF A TURBULENT, SWIRLING JET IN A CO-FLOWING STREAM
J. A. Schetz 21 Oct. 1971 17 p refs
(DLR-FB-71-80) Avail: NTIS HC $3.00; DFVLR, Porz: 7 DM

An approximate analysis of the flow field produced by a turbulent, swirling jet in a co-flowing stream is developed. Employing a linearization of the equations of motion and an eddy viscosity model for turbulent transport in the swirl direction adapted from incompressible, wing tip vortex work, the decay of the swirl can be solved for independently. The use of a more accurate linearization, taking the center line value of the axial velocity as an effective convection velocity requires a specification of the axial turbulent transport in relation to that in the swirl direction. In any case, it is found that the swirl velocity decays slowly from its initial value. Author

N72-24362*# National Bureau of Standards, Boulder, Colo.
A COMPUTER PROGRAM FOR THE CALCULATION OF THERMAL STRATIFICATION AND SELF-PRESSURIZATION IN A LIQUID HYDROGEN TANK
R. W. Arnett and R. O. Voth Washington NASA May 1972 132 p refs
(NASA Order C-33768B)
(NASA-CR-2026) Avail: NTIS HC $3.00 CSCL 20D

An analysis and computer program are described for calculating the thermal stratification and the associated self-pressurization of a closed liquid hydrogen tank. FORTRAN-IV language is used and runs were made on IBM 360/65 and CDC 3600 computers. Comparisons are made between the program calculations and test results from both ground and orbital coast tests of a Centaur space vehicle. Author

N72-24363*# National Bureau of Standards, Boulder, Colo.
CAVITATION IN LIQUID CRYOGENS. 1: VENTURI
J. Hord, L. M. Anderson, and W. J. Hall Washington NASA May 1972 89 p refs
(NASA Order C-39004B)
(NASA-CR-2054) Avail: NTIS HC $3.00 CSCL 20D

The results of continuing cavitation studies are reported. The cavitation characteristics of liquid hydrogen and liquid nitrogen flowing in a transparent plastic Venturi are discussed.

Thermodynamic data, consisting of pressure and temperature measurements within fully developed hydrogen cavities, are reported. Details concerning test apparatus, test procedure, and data correlation techniques are given. Author

N72-24364# Technische Hogeschool, Delft (Netherlands). Lab. voor Aero- en Hydrodynamica.
TURBULENT FLUID AND PARTICLE INTERACTION
J. O. Hinze Nov. 1971 26 p refs Presented at Intern. Symp. on Two-Phase Systems, Haifa, Israel, 29 Aug. - 2 Sep. 1971
(WTHD-32) Avail: NTIS HC $3.50

Basic aspects following from the interaction between fluid and discrete particles are discussed. A single particle in a turbulent flow field is investigated. The basic equation describing the motion of a particle has a number of terms which can either be given in a formal way only, or which contain parameters that depend strongly on the nature of both the particle and the fluid, and on the turbulent fluid motion. A description of the behaviour of the particle depending on the magnitude of those parameters and in the light of the ratio between response time and many characteristic times of the turbulence is given. The study of long-time behaviour of the particle following the Lagrangian description leads to considering the turbulent diffusion of the particle relative to that of the fluid. Some attention is paid to the effect of spatial inhomogeneity of the mean flow field. Author

N72-24365*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EXPERIMENTAL SURFACE FLOW PATTERNS AND FLOW-FIELD PHENOMENA OF A DELTA-WING SPACE-SHUTTLE ORBITER
Joseph W. Cleary Feb. 1972 51 p refs
(NASA-TM-X-62113) Avail: NTIS HC $4.75 CSCL 20D

Composite photographs of the surface flow and shadowgraphs of the shock wave pattern are presented that depict the hypersonic flow field of a typical delta wing space shuttle orbiter. Results from a wind tunnel test in air are given in side, oblique, and projected plan views for angles of attack from 0 to 60 deg. The tests were conducted at a Mach number of 7.4 and for Reynolds numbers based on body length of 6,000,000 and 9,000,000. The interrelationship is shown for the intersecting bow and wing leading edge waves with the surface flow for angles of attack for which: (1) the leading edge wave is attached, and (2) the leading edge wave is detached. Author

N72-24366*# United Aircraft Corp., East Hartford, Conn.
SYSTEMATIC TWO-DIMENSIONAL CASCADE TESTS. VOLUME 3: SLOTTED DOUBLE CIRCULAR-ARC HYDROFOILS
R. M. Columbo and T. A. Murrin 1 May 1972 190 p refs
(Contract NAS3-4148)
(NASA-CR-72870; UARL-L930845-81-Vol-3) Avail: NTIS HC $11.50 CSCL 20D

Performance parameters are presented for cascades of slotted double circular-arc hydrofoils tested over a range of systematically introduced variables in a rectilinear cascade tunnel which uses water as the test medium. Cascade configurations included various combinations of an inlet flow angle of 50, 60 and 70 deg; a cascade solidity of 0.75, 1.00 and 1.50; a hydrofoil camber angle of 20, 30, 40 and 45 deg; and angles of incidence between positive and negative stall. The slot was positioned at the 45 percent chord station and the slot exit width was 0.047-in. Tests were also performed with the slot positioned at the 35 percent chord station and with slot widths of 0.63 and 0.094-in. These data were correlated to indicate the effects of slot location and slot width on minimum loss incidence and deviation angles. In addition, a comparison is presented of the performance parameters for cascades of slotted and unslotted hydrofoils. Author

N72-24367*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EXPERIMENTAL INVESTIGATION OF AN AXISYMMETRIC FREE JET WITH AN INITIALLY UNIFORM VELOCITY PROFILE
Thomas L. Labus and Eugene P. Symons Washington May 1972 24 p refs
(NASA-TN-D-6783; E-6801) Avail: NTIS HC $3.00 CSCL 20D

An experimental investigation was conducted to determine the flow characteristics of a circular free helium jet having an initially uniform velocity profile. Complete velocity profiles are presented at Reynolds numbers of 1027 and 4571 at 0, 3, 6, 10, 15, and 20 nozzle diameters (where possible) from the nozzle exit. Centerline velocity decay and potential core length were obtained over a range of Reynolds numbers from 155 to 5349 at distances up to and including 25 nozzle diameters from the nozzle exit. The angles of spread associated with the diffusion of the jet downstream of the nozzle are also given. Axial jet momentum flux and entrained mass flux, at various distances downstream of the nozzle, are presented as a function of the jet Reynolds number. Author

N72-24368# National Aerospace Lab., Amsterdam (Netherlands).
ON A KERNEL-FUNCTION METHOD FOR THE CALCULATION OF PRESSURE DISTRIBUTIONS ON WINGS WITH HARMONICALLY OSCILLATING CONTROL SURFACES IN SUBSONIC FLOW
R. J. Zwaan 3 Aug. 1971 54 p refs Supersedes NLR-TR-70122-U
(NLR-TR-70123-U; NLR-TR-70122-U) Avail: NTIS HC $4.75

Local solutions for the pressure distribution at the leading and side edges of harmonically oscillating unbalanced control surfaces have been fitted into an existing lifting surface method for wings without control surfaces. Calculated results are compared with results of other methods and with experiments. Author

N72-24369# National Aeronautical Establishment, Ottawa (Ontario).
FLOW VISUALIZATION IN THE NATIONAL AERONAUTICAL ESTABLISHMENT'S WATER TUNNEL
G. A. Dobrodzicki Feb. 1972 56 p refs Original contains color illustrations
(LR-557; NRC-12506) Avail: NTIS HC $5.00

The utility of the flow visualization water tunnel in the field of experimental fluid dynamics and guidance to its prospective users is provided. A brief description of the facility and its ancillary equipment is followed by a resume of the flow visualization techniques. To emphasize the diversity of subjects tested in the water tunnel, a list of typical experiments and a number of photographs are included. Author

N72-24370# Tokyo Univ. (Japan). Inst. of Space and Aeronautical Science.
SPHERICAL SOURCE FLOW EXPANSION OF SINGLE MONATOMIC GASES INTO VACUUM Ph.D. Thesis
Takeo Soga Mar. 1972 23 p refs
(ISAS-478-Vol-37-No-4) Avail: NTIS HC $3.25

The source flow expansion of single monatomic gases into a vacuum is studied on the basis of the B-G-K kinetic equation. The analysis is made by means of a numerical method proposed, in combining the discrete ordinate method. The actual calculations are carried out covering a spatial region from the isentropic upstream to the far downstream over a side range of the Knudsen numbers, for both hard sphere and Maxwell molecules. It is found that in the far downstream the velocity distribution function is asymmetric with respect to the radial velocity. The results for the macroscopic quantities are compared with the results of previous treatments, and found to be in a reasonable agreement with the numerical experiment by means of the Monte-Carlo method. Author

N72-24371# National Aeronautical Lab., Bangalore (India).
GAS MIXING IN THE DILUTION ZONE OF A COMBUSTION CHAMBER

K. Sridhara Dec. 1970 16 p refs Presented at 3d Natl. Symp. on Combustion, Madras, 17-19 Dec. 1969; sponsored by IIT Supported by the Intern. Civil Aviation Organ., 1966-1967
(NAL-TN-30) Avail: NTIS HC $3.00

The mixing characteristics of cold air jets injected perpendicularly into a hot gas stream were studied experimentally under simulated aircraft gas turbine combustion chamber conditions. Temperature traverses were made at three cross sections downstream of the jet origin. The temperatures were all recorded automatically and processed to determine the traverse quality which was expressed as a standard deviation of temperature. Effects of jet to primary stream velocity ratio, flow rate ratio and temperature ratio were investigated. Results indicate that each mixing geometry was associated with an optimum mass flow rate ratio for obtaining best mixing, irrespective of temperature ratio. The importance of such mixing studies in the design of combustion chamber dilution zone systems is discussed. Author

N72-24372# National Aeronautical Lab., Bangalore (India).
A STUDY OF THE ASYMPTOTIC BEHAVIOUR OF COMPRESSIBLE LAMINAR BOUNDARY LAYERS OF A DISSOCIATING GAS
R. Gopinath and N. R. Subramanian Oct. 1970 14 p refs
(NAL-TN-28) Avail: NTIS HC $3.00

The structure of the hypersonic laminar boundary layer of an ideal dissociating gas far from the wall surface has been analyzed both analytically and numerically for two cases: frozen flow and equilibrium flow corresponding to the local pressure and temperature, respectively. It has been observed that the transition zone which exists in the perfect gas case is smeared out, due to the coupling between the imperfect nature of the gas and the viscosity of the gas. Author

N72-24373# National Aeronautical Lab., Bangalore (India).
A STUDY OF THE EFFECT OF PRESSURE GRADIENT ON COMPRESSIBLE LAMINAR BOUNDARY LAYERS AT LARGE PRANDTL NUMBERS
R. Gopinath and A. V. Murthy Apr. 1970 27 p refs Presented at the Indian Rocket Soc. Meeting, Trivandrum, India, 27 Dec. 1969
(NAL-TN-25) Avail: NTIS HC $3.50

The asymptotic behavior of compressible laminar similar boundary layers with pressure gradient has been analyzed for large Prandtl numbers. A sort of hybrid technique which essentially involves the use of the method of matched asymptotic expansions for the energy equation and Meksyn's method for the momentum equation has been used in order to solve the coupled momentum and energy equations. Also, exact numerical solutions have been obtained for Prandtl numbers up to thirty and for a pressure gradient parameter beta = 0.2, for the heat transfer as well as the plate insulated cases by the Newton-Raphson's technique. Author

N72-24374# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Berlin (West Germany). Inst. fuer Turbulenzforschung.
CONDENSATION OF THE GASEOUS PHASE OF A FAST FLOWING ONE-COMPONENT LIQUID-METAL DROPLET-GAS-MIXTURE
U. Michel 1972 120 p refs In GERMAN; ENGLISH summary
(DLR-FB-72-01) Avail: NTIS HC $8.00; DFVLR, 505 Porz-Wahn, Linder Hoehe: DM 31, 70

The condensation of the gaseous phase of a fast flowing potassium droplet gas mixture with minimum mechanical energy losses is studied. Two ways of condensation are investigated theoretically, the condensation on an injected subcooled liquid hollow core jet of the same metal (injection condensation), and the condensation on a subcooled wall (wall condensation). It is shown, what mechanical and thermodynamical efficiencies can be achieved and how large such condensers become. Condensers of this kind are needed for the realization of certain thermodynamic cycles with liquid metals as working fluids, proposed to drive magnetohydrodynamic generators for electrical power generation. Author

N72-24375# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Freiburg (West Germany). Inst. fuer Angewandte Mathematik und Mechanik.
LAMINAR BOUNDARY LAYERS IN TWO DIMENSIONAL AND AXIALLY SYMMETRIC LAVAL NOZZLES
D. Geropp 1971 61 p refs In GERMAN; ENGLISH summary
(DLR-FB-71-90) Avail: NTIS HC $5.25; DFVLR, 505 Porz-Wahn, Linder Hoehe: DM 15, 90

For a family of two dimensional and axially symmetric Laval nozzles there are deduced new similar solutions of the differential equations for compressible laminar boundary layers. Introducing the conditions Pr nearly equal to 1 and mu different to T and assuming the wall of nozzles to be thermically insulated all variables of boundary layers are presented in closed form. The loss of mass transfer produced by the displacement of boundary layers is investigated. Using an adapted shape parameter of nozzles the obtained results can be approximately given up to nozzles which have other shapes than the shapes of the presented family. Author

N72-24376# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Berlin (West Germany). Inst. fuer Turbulenzforschung.
MEASUREMENT OF PRESSURE FLUCTUATIONS WITHIN SUBSONIC TURBULENT JETS
H. V. Fuchs 1971 41 p refs
(DLR-FB-71-109) Avail: NTIS HC $4.25; DFVLR, 505 Porz-Wahn, Linder Hoehe: Dm 12, 80

The possibilities and limitations of direct fluctuating pressure measurements in turbulent flows are discussed. Insertion of pressure probes into the flow gives rise to several error mechanisms, some of which are treated analytically. Experiments with standard condenser microphones are confined to the so called potential core of circular air jets. In connection with earlier publications, further support is deduced that pressure measurements can help to extend our understanding of the turbulence structure in a number of flows where hitherto mainly hot-wire techniques are applied. Author

N72-24377# Tokyo Univ. (Japan). Inst. of Space and Aeronautical Science.
MONTE CARLO CALCULATION OF HYPERSONIC RAREFIED GAS FLOWS PAST TWO-DIMENSIONAL AND AXISYMMETRIC BODIES
Michitoshi Takagi Dec. 1971 75 p refs
(ISAS-473-Vol-36-No-15) Avail: NTIS HC $5.75

A direct simulation Monte Carlo method was developed to solve flow field problems around a two-dimensional or axisymmetric body immersed in a hypersonic rarefied gas. A steady solution is obtained as the non-steady solution at infinity. The method was applied to the flow field on a highly cooled flat plate placed parallel to the direction of a uniform flow. Physical properties of the body surface, (pressure, skin friction, heat transfer, and slip velocity distributions) were also calculated. Flow fields around circular cylinders and spheres with highly cooled and near adiabatic conditions were investigated in order to study the effect of the body temperature on the flow field. The solutions for bodies with different radii were also obtained in a study of the effect of Knudsen number. Pressure and heat transfer distributions, and drag, were calculated for these cases. Experiments on surface pressure distributions of a circular cylinder and sphere, and drag of the sphere, were also performed. Author

N72-24378# California Univ., Livermore. Lawrence Livermore Lab.
NUMERICAL STUDIES OF LAMINAR, FREE CONVECTION IN A HORIZONTAL FLUID LAYER HEATED FROM BELOW
William H. Plows Dec. 1971 169 p refs Sponsored AEC

(UCRL-51146) Avail: NTIS

The results of grid-method calculations of steady laminar free convection in a fluid layer bounded by horizontal parallel plates and heated from below are presented. The flow is assumed to be two-dimensional to satisfy the Boussinesq approximation. In order to be two-dimensional, the convection cells have to be of a roll-type with horizontal axes rather than of polygonal planform with vertical axes. Calculations are performed in three configurations: (1) a horizontally unbounded region of parallel rolls, infinite in axial length and periodic in the horizontal direction perpendicular to their axes, (2) a region bounded by two parallel vertical walls, and (3) a cylindrical region in which the roll cells are like concentric doughnuts. Author

N72-24379# Institut fuer Plasmaphysik G.m.b.H., Garching (West Germany).

INVESTIGATION OF COLLECTIVE DISSIPATION PROCESSES IN COLLISIONLESS SHOCK WAVES MEANS OF LASER SCATTERING

K. H. Steuer Oct. 1971 61 p refs In GERMAN

(IPP-1/122) Avail: AEC Depository Libraries

A 90 deg laser scattering experiment (alpha is much less than 1) established that the electrons in stationary collisionless shock waves with Mach numbers between 2 and 3 are strongly heated by nonclassical dissipation processes. The frequency and wavelength spectra of the microinstabilities causing the collisionless heating and their excitation mechanism were measured by laser forward scattering (theta = 2 to 6 deg; alpha equal to, or greater than 1). The scattering intensity, which is strongly enhanced fork k (< 1/D (D: Debye length). and the asymmetry of the scattering spectrum show that high-amplitude electron density waves (approximately 250 times superthermal) are excited in a preferential direction in the shock front. The direction and magnitude of the line shift of the scattered light relative to the incident laser line reveal that the current in the shock front is responsible for exciting a drift instability. NSA

N72-24380# Institut Franco-Allemand de Recherches, St. Louis (France).

METHOD FOR CALCULATING AN UNSTEADY ONE-DIMENSIONAL FLOW WITH AN ARBITRARY NUMBER OF DISCONTINUITIES [METHODE DE CALCUL D'UN ECOULEMENT MONODIMENSIONNEL INSTATIONNAIRE COMPORTANT UN NOMBRE ARBITRAIRE DE DISCONTINUITES]

G. Freiss 1 Feb. 1971 41 p refs In FRENCH

(ISL-2/71) Avail: NTIS HC $4.25

A finite difference method for calculating nonequilibrium gas flows with detached shock waves in the processing discontinuities such as shock fronts and boundary layers between different fluids is described and compared with other methods. The advantages of this method, which permits the calculation of multifluid flows, are shown. The application of the method to shock tubes with reflected waves and to tunnels obstructed by a cone are studied. Author (ESRO)

N72-24381# Institut Franco-Allemand de Recherches, St. Louis (France).

DIVERGENT CONICAL FLOWS OF A REAL GAS IN CHEMICAL EQUILIBRIUM [ECOULEMENTS CONIQUES DIVERGENTS D'UN GAZ REEL EN EQUILIBRE CHIMIQUE]

B. C. Jaeggy and M. Berna 22 Oct. 1970 39 p refs In FRENCH

(ISL-20/70) Avail: NTIS HC $4.00

Results gained using a computer program for the calculation of conical flow of a real gas in a state of chemical equilibrium are compared with theoretical values for the conical flow of ideal gases. The different cases treated show that in the case of a moving conical bullet in the atmosphere the ideal gas hypothesis is only valid if the product of the Mach number, the sine of the half cone angle is less than 5. Author (ESRO)

N72-24382# Army Missile Command, Redstone Arsenal, Ala. Physical Sciences Directorate.

ELECTRON RECOMBINATION IN EXPANDING SUPERSONIC FLOWS

T. E. Horton and Charles Cason 14 Sep. 1971 52 p refs

(DA Proj. 1T2-62303-A-308)

(AD-738108; RR-TR-71-11) Avail: NTIS CSCL 20/4

Recombination processes of electrons in supersonic flows have been studied using the coupled set of continuity, momentum, energy, and appropriate rate equations. The solution of these equations for a one-dimensional supersonic nozzle flow gives rise to a useful similarity transformation. The similarity solution was found to have very good agreement with numerical solutions of the recombination problem. This analysis predicts the conditions and location in a nozzle for the electron temperature to freeze and also conditions required for the electron density to freeze. Example calculations are made for argon. This method is expected to be useful for studying systems using recombination effects such as magnetohydrodynamics lasers and chemical lasers. Author (GRA)

N72-24383# California Inst. of Tech., Pasadena. Graduate Aeronautical Labs.

THE EFFECT OF DENSITY DIFFERENCES ON THE TURBULENT MIXING LAYER

Garry Brown and Anatol Roshko Sep. 1971 14 p refs Presented at AGARD Fluid Dyn. Panel Specialists' Meeting on Turbulent Shear Flows, London, 13-15 Sep. 1971

(Contract N00014-67-A-0094-0001)

(AD-737731) Avail: NTIS CSCL 20/4

An experimental study has been made of the turbulent mixing layer between two streams of different gases, especially nitrogen and helium. This was made in a new flow apparatus, designed to produce good quality flow at pressures up to 10 atmospheres with run times as low as 1 or 2 seconds. High-speed measurement techniques, including a novel density probe, were used. The similarity properties of the mixing layers are established from profiles of mean velocity and density, and from these the basic flow parameters are computed including spreading rate, dissipation rate, and shear stress distribution.

GRA

N72-24384# Naval Ordnance Lab., White Oak, Md.

THE SHOCK HEIGHTS OF STATIC FREE JETS

Richard T. Driftmyer 11 Jan. 1972 39 p refs

(AD-738420; NOLTR-72-23) Avail: NTIS CSCL 20/4

The report describes the results of an experimental study involving a two-dimensional, underexpanded, free jet flowing into a static medium. The investigation was concerned with the determination of jet heights as a function of the nozzle flow properties. In support of this objective experimental results of two supersonic nozzles (Mach numbers of 2.89 and 2.99 and throat widths of 0.0335 inch and 0.0204 inch, respectively) are presented along with a complete data tabulation which includes photographs. A universal data correlation, expanded to include the axisymmetric jet case, is presented. GRA

N72-24385# Illinois Inst. of Tech., Chicago. Dept. of Mechanical and Aerospace Engineering.

LESSONS FROM TRANSITION OF SHOCK TUBE BOUNDARY LAYERS

Mark V. Morkovin Nov. 1971 21 p refs

(Contract F44620-69-C-0022; AF Proj. 9560; Proj. Themis)

(AD-738355; AFOSR-72-0057TR; THEMIS-IIT-71-2) Avail: NTIS CSCL 20/4

Experimental observations of transition from laminar to turbulent boundary layers in shock tubes is reviewed. The seemingly contradictory behavior is viewed in the light of transition behavior in other ground facilities. Comparison with linearized stability theory of Ostrach and Thornton indicates that transition takes place precritically, presumably due to finite disturbances. This fact could make shock tubes a convenient milieu for studying the elusive regime where high cooling is

matched with high unit Reynolds number and controllable roughness. The paper was part of the background material for the Workshop of Specialists in Boundary-Layer Transition, held in November 1971 at the Aerospace Corporation, San Bernardino, California. GRA

N72-24386# Boeing Scientific Research Labs., Seattle, Wash.
ON SLUGS AND PUFFS IN TRANSITIONAL PIPE FLOW Final Report
I. J. Wygnanski and F. H. Champagne Jan. 1972 114 p refs
(Contract F44620-71-C-0079; AF Proj. 9781)
(AD-737524; D180-14476-1; AFOSR-72-0457TR) Avail: NTIS CSCL 20/4

Conditionally sampled hot-wire measurements were taken in a pipe at Reynolds numbers corresponding to the onset of turbulence. The pipe was smooth and carefully aligned so that turbulent slugs appeared naturally at a Reynolds number greater than 50,000. Transition could be initiated at lower Reynolds numbers by introducing disturbances into the inlet. For slightly disturbed inlet, turbulent slugs were observed which occupied the entire cross section of the pipe, growing in length as they proceed downstream. When a large disturbance was introduced into the inlet, the turbulent regions which were convected downstream were designated as puffs. Results of the study are discussed. GRA

N72-24387# RAND Corp., Santa Monica, Calif.
ON TWO-DIMENSIONAL TEMPERATURE MODELING
Joel S. Kvitky Oct. 1971 57 p refs
(AD-737674; P-4713) Avail: NTIS CSCL 20/4

The paper is intended to provide the theoretical and practical framework for a two-dimensional temperature model. The motivation for this study is provided by the existence, at Rand, of a general two-dimensional flow-reaction simulation model developed by J. Leendertse and E. Gritton. The vertically integrated mass balance equations of the simulation model are discussed and shown to apply to temperature modeling. Terms contributing to the total heat flux across the water surface are described and approximated by empirical relations which, in turn, are integrated into the temperature model through an equilibrium temperature and heat exchange coefficient. Author (GRA)

N72-24388# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
SHOCK IMPINGEMENT CAUSED BY BOUNDARY LAYER SEPARATION AHEAD OF BLUNT FINS
L. G. Kaufman, II, Robert H. Korkegi (Aerospace Res. Labs.), and Leo C. Morton (Aerospace Res. Labs.) Feb. 1972 22 p refs Sponsored by AF
(AD-737507; RM-536) Avail: NTIS CSCL 20/4

High speed flow past a blunt protuberance on a surface results in a complex, three dimensional, inviscid-viscous interaction flow field. Characteristically, the interaction results in a separated flow region composed of horseshoe vortices near the surface, and a lambda-type shock pattern in the plane of symmetry ahead of the protuberance. The shock wave emanating from the separated flow region impinges on the bow shock ahead of the protuberance and causes intense heating and high pressures locally on the protuberance leading edge. The heating and pressure in this local area can be 10 times larger than the undisturbed stagnation line values; the amplification depends strongly on local flow conditions. Tests were conducted to examine and obtain a better understanding of these interaction flow fields; the most recent tests included detailed flow field surveys for Mach 3 flows ahead of blunt fins on a flat plate surface with turbulent boundary layers. Author (GRA)

N72-24389# RAND Corp., Santa Monica, Calif.
A SURVEY OF DATA FOR TURBULENT BOUNDARY LAYERS WITH MASS TRANSFER
Donald Coles Sep. 1971 17 p refs
(AD-738102; P-4697) Avail: NTIS CSCL 20/4

A critical survey is made of available experimental data on turbulent boundary layers with mass transfer in the absence of complicating factors such as compressibility and pressure gradient. Two approaches to the data show particular promise. The first is the mixing-length approach. The second is an attempt to generalize the kind of analysis often used for free shear flows such as wakes or jets. The essential step is definition of a characteristics velocity in terms of a characteristic stress which occurs somewhere in the layer. GRA

N72-24390# RAND Corp., Santa Monica, Calif.
THE DEFORMATION AND MASS LOSS OF LIQUID DROPS IN A HIGH SPEED FLOW OF GAS
R. Collins and A. F. Charwat Aug. 1971 36 p refs
(AD-738081; P-4685) Avail: NTIS CSCL 20/4

When a vehicle traveling at high speed enters a gas containing a suspension of liquid drops, these drops are accelerated by the gas being pushed ahead of the vehicle. Some of them may be light enough to be caught up in the streamlines of the gas flow, and pass around the vehicle. Others will be overtaken and impinge upon the surface of the vehicle. Such a process may be related directly to an aircraft entering a cloud or being subjected to rain erosion. In such cases, it is of interest to know the mass and velocity of the drop as it strikes the vehicle. The deformation of a liquid drop placed suddenly into a uniform high-speed gas flow is analyzed. The drop deforms into a shape resembling a saucer, whose edges break off as they become progressively thinner. The mass loss is analyzed. GRA

N72-24391# Purdue Univ., Lafayette, Ind.
INVISCID FREE JET FLOW WITH LOW SPECIFIC HEAT RATIOS
Jan. 1972 9 p refs Prepared in cooperation with Yale Univ., New Haven, Conn. Submitted for publication
(Contract N00014-67-A-0226-0005; Proj. SQUID; NR Proj. 098-038)
(AD-737989; SQUID-TR-PR-122-PU) Avail: NTIS CSCL 20/4

Method-of-characteristics calculations are reported for free jet expansions of gases with specific heat ratios of 1.30, 1.20, 1.10 and 1.05. Results are given graphically and by a curve-fitting formula. GRA

N72-24392# Purdue Univ., Lafayette, Ind.
ASYMPTOTIC ANALYSIS OF TURBULENT CHANNEL AND BOUNDARY LAYER FLOW
William A. Bush and Francis E. Fendell Jan. 1972 61 p refs Prepared in cooperation with TRW Systems Group, Redondo Beach, Calif.
(Contract N00014-67-A-0226-0005; Proj. Squid)
(AD-737990; SQUID-TR-TRW-2-PU) Avail: NTIS CSCL 20/4

Asymptotic expansion techniques are used in the limit of large Reynolds number, to study the structure of fully turbulent shear layers. Two cases examined are channel (or pipe) flow and two-dimensional boundary layer flow with an applied pressure gradient, upstream of any separation. Attention, for these two cases, is confined to the flow of incompressible constant-property fluids. Closure is effected through the introduction of an eddy viscosity model formulated with sufficient generality so that most existing models are special cases. GRA

N72-24393# Dayton Univ. Research Inst., Ohio. Research Inst.
ACCURACY OF WEIGHTED RESIDUAL SOLUTIONS OF THE BOUNDARY LAYER EQUATIONS Final Report, 1 May 1970 - 30 Apr. 1971
Jack G. Crouch and Charles J. Nietubicz Oct. 1971 96 p refs
(Contract F33615-70-C-1579; AF Proj. 7071)
(AD-738338; UDRI-TR-71-19; ARL-71-0217) Avail: NTIS CSCL 20/4

This research is concerned with investigating the possibility of optimizing Galerkin approximate solutions for boundary layer flow problems. It is shown that the accuracy of Galerkin velocity

profiles is strongly dependent on the functions used in the approximate solution. In fact, the accuracy appears to depend continuously on the shapes of the approximating functions. Thus a solution optimization technique based on minimizing the upper error bound may be possible. A digital computer program for generating weighted-residual boundary layer solutions has been developed. *GRA

N72-24394# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AIRPLANE STABILITY FOR FLIGHT WITH CONSTANT ANGULAR VELOCITY AROUND THE LONGITUDINAL AXIS
Milorad Pastrakuljic 29 Nov. 1971 11 p refs Transl. into ENGLISH from Navchno-Tehnicki Pregled (Yugoslavia), v. 20, no. 5, 1970 p 37-41
(AD-738231; FTD-HC-23-829-71) Avail: NTIS CSCL 20/4

The paper considers the effects of longitudinal acceleration and magnus forces and moments on stability of aircraft having single plane of symmetry and gives expressions allowing estimation of cases when such effects should be taken into account. Author (GRA)

N72-24395# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Techology Div.
SHOCK TUBE WITH A DIFFUSER NEAR DIAPHRAGM
V. V. Grigorev, S. N. Isakov, and B. A. Kuklin 23 Nov. 1971 14 p refs Transl. into ENGLISH from Tr. Leningr. Politekhan. Inst. (Moscow), no. 313, 1970 p 131-136
(AD-738248; FTD-MT-24-931-71) Avail: NTIS CSCL 14/2

A consideration is given of various models of the gas flow in a shock tube with a diffuser in the range of low shock wave mach numbers. Expressions are derived which relate the shock wave intensity to the initial conditions in the high and low pressure chambers. A brief review is presented of the special features of the design of a device of this type. The preliminary experimental data obtained are compared with theoretical estimates. GRA

N72-24118# Joint Publications Research Service, Arlington, Va.
SOME CHARACTERISTICS OF THE HYDRODYNAMICS OF AN ENGINE OF THE FLAPPING WING TYPE
Yu. K. Savchenko *In its* Bionics 15 May 1972 p 10-22 refs (See N72-24117 15-05)
Avail: NTIS HC $12.75

N72-24119# Joint Publications Research Service, Arlington, Va.
BOUNDARY LAYER OF AN ANISOTROPIC FLUID
Ye. Yu. Taran and Yu. I. Shmakov *In its* Bionics 15 May 1972 p 52-59 refs (See N72-24117 15-05)
Avail: NTIS HC $12.75

N72-24120# Joint Publications Research Service, Arlington, Va.
STABILITY OF THE LAMINAR BOUNDARY LAYER ON A DEFORMABLE PLATE
L. V. Kondratyeva and V. V. Skripachev *In its* Bionics 15 May 1972 p 60-65 refs (See N72-24117 15-05)
Avail: NTIS HC $12.75

N72-24121# Joint Publications Research Service, Arlington, Va.
EQUATIONS FOR A BOUNDARY LAYER ON A DEFORMABLE CONTOUR
V. M. Zhurva and Yu. I. Fadeyev *In its* Bionics 15 May 1972 p 66-74 refs (See N72-24117 15-05)
Avail: NTIS HC $12.75

13 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; oceanography; cartography; and geodesy. For related information see also: 20 Meteorology; 29 Space Radiation; and 30 Space Sciences.

N72-24396* Wisconsin Univ., Madison.
APPLICATIONS OF AIRBORNE REMOTE SENSING TECHNOLOGY Journal of the Surveying and Mapping Div.
Ralph W. Kiefer and James P. Scherz Oct. 1971 26 p refs Presented at the ASCE Natl. Meeting on Transportation Eng., Washington, D. C., 21-25 Jul. 1969
(Grant NGL-50-002-127)
(NASA-CR-126628; Rept-8) Copyright. Avail: Wis. Univ., Madison, 351 Meteorology and Space Sci. Bldg.: HC $0.50 CSCL 08G

The electromagnetic spectrum and remote sensing instruments are considered. Aerial photographic processes and the applications of aerial photography are discussed. Thermal infrared imagery, multichannel imagery, side-looking airborne radar, and other sensors are described. K.P.D.

N72-24397* Wisconsin Univ., Madison. Dept. of Civil Engineering.
EFFECTS OF DATE OF PHOTOGRAPHY ON AIRPHOTO INTERPRETATION
Ralph W. Kiefer Nov. 1971 27 p refs Presented at Proc. of the 1970 Intern. Symp. on Photography and Navigation, Columbus, Ohio, 25-28 May 1970
(Grant NGL-50-002-127)
(NASA-CR-126632; Rept-9) Copyright. Avail: Wis. Univ., Madison, 351 Meteorology and Space Sci. Bldg.: HC $2.00 CSCL 14E

More than 3000 exposures of color and color-infrared film on 35 mm format were taken of selected sites in southern Wisconsin during 1969 from elevations of 2000 to 8000 feet above the terrain. The subject matter included rural terrain (cropland, grazing land, and woodland), lakes (showing weed and algae growth), and river flood plains (showing river flooding and subsequent crop damage). Some of the photographs taken for the purposes of soil studies and flood studies are described. Certain intensive study sites were photographed on as many as 20 different dates during the year. The striking changes in texture, tone, and color that occur from day-to-day and month-to-month at selected sites are illustrated. The results of this research show that there are certain optimum dates during the year for the procurement of aerial photography for interpretive uses and that the optimum date of photography may not be the same for all interpretive uses. Author

N72-24398* Wisconsin Univ., Madison.
AN ANNOTATED BIBLIOGRAPHY OF REMOTE SENSING AT THE UNIVERSITY OF WISCONSIN
Edmund R. Belak, Jr. Oct. 1970 16 p refs
(Grant NGL-50-002-127)
(NASA-CR-126639; Rept-2) Copyright. Avail: Wis. Univ., Madison, 351 Meteorology and Space Sci. Bldg.: HC $2.00 CSCL 08G

A bibliography is presented on remote sensing programs conducted under the auspices of the University of Wisconsin. Topics studied included water quality management, watershed management, large water bodies, atmospheric effects, and remote imagery. K.P.D.

N72-24399* Wisconsin Univ., Madison.
MONITORING WATER POLLUTION BY MEANS OF REMOTE SENSING TECHNIQUES
James P. Scherz Apr. 1971 39 p refs
(Grant NGL-50-002-127)

(NASA-CR-126640; Rept-3) Copyright. Avail: Wis. Univ., Madison, 351 Meteorology and Space Sci. Bldg.: HC $2.00 CSCL 08H

The use of airborne remote sensors for observing water pollution is discussed. The advantages of remote sensing imaging are considered. Methods of correlating thermal imagery with water conditions are presented. K.P.D.

N72-24400* Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.

SEQUENTIAL AERIAL PHOTOGRAPHY AND IMAGERY FOR SOIL STUDIES

Ralph W. Kiefer Jan. 1972 26 p refs Presented at Symp. on Remote Sensing for Highway Eng., Washington, D. C., Jan. 1972

(Grant NGL-50-002-127)

(NASA-CR-126633; Rept-10) Copyright. Avail: Wis. Univ., Madison, 351 Meteorology and Space Sci. Bldg.: HC $2.00 CSCL 14E

Color infrared photographs and thermal images from agricultural fields located at the former shoreline of a small glacial lake are presented. The contrast between the silty lakebed soils and a small sandy beach ridge can be clearly seen. The contrast between this beach ridge and the surrounding lakebed soils changes considerably during the year. Based on the preliminary work reported herein, it appears that thermal imagery may prove superior to photography for soil mapping purposes. There should be an optimum time of year and also an optimum time of day for obtaining thermal imagery for soil studies. Author

N72-24401* Wisconsin Univ., Madison. Dept. of Civil Engineering.

AN INTRODUCTION TO REMOTE SENSING FOR ENVIRONMENTAL MONITORING

James P. Scherz, Alan R. Stevens, and Edmund R. Belak, Jr., ed. Apr. 1970 83 p refs

(Grant NGL-50-002-127)

(NASA-CR-126630; Rept-1) Copyright. Avail: Wis. Univ., Madison, 351 Meteorology and Space Sci. Bldg.: HC $2.00 CSCL 08D

An overall view is given of the electromagnetic energy spectrum. Remote sensing instruments are described that have potential use from either aircraft or satellites. Emphasis is on photographic, thermal imagery, side-looking radar, and passive microwave systems. Five basic areas are covered: (1) theory of the electromagnetic spectrum; (2) hardware presently used in remote sensing; (3) present and future applications of remote sensing; and (4) library sources for remote sensing material. Author

N72-24402* Wisconsin Univ., Madison.

DETERMINATION OF OIL FILM DEPTHS FOR WATER POLLUTION CONTROL

John F. VanDomelen and Edmund R. Belak, Jr., ed. Jun. 1971 20 p refs

(Grant NGL-50-002-127)

(NASA-CR-126634; Rept-4) Copyright. Avail: Wis. Univ., Madison, 351 Meteorology and Space Sci. Bldg.: HC $2.00 CSCL 08J

Research was initiated to determine if a reasonably inexpensive, easy to use system could be developed with off-the-shelf components to detect the thickness of an oil spill. Because of the high costs involved in obtaining the equipment and the complexity involved in operating it, procedures explored the use of color and color infrared photography with or without the use of polarizing filters. Color reversal films for use in a 35 mm. three camera bank were selected. Color reversal film was selected because of the ease of repeatability and reliability of color results and the relatively low cost of the final product. Field procedures, image analysis using spectrophotometer and microdensitometer, and results of experiments conducted on bright and cloudy days are described. Tests revealed that there is a correlation between the depth of the oil spill and the percentage of light reflected. Author

N72-24403* Wisconsin Univ., Madison. Dept. of Civil Engineering.

A LITERATURE REVIEW OF REMOTE SENSING FOR WATER QUALITY

Lorne C. Gramms, William C. Boyle, and Edmund R. Belak, Jr., ed. Oct. 1971 35 p refs

(Grant NGL-50-002-127)

(NASA-CR-126638; Rept-7) Copyright. Avail: Wis Univ., Madison, 351 Meteorology and Space Sci. Bldg.: HC $2.00 CSCL 08H

Remote aerial sensing techniques were employed to observe the following water quality criteria: grease and floating solids, nonbiological turbidity, color, and temperature. Some secondary effects that are associated with above parameters, like dissolved oxygen and algal growth potential, were also determined. Multispectral photographic methods consisted of color photography, infrared photography, black and white photography, thermal radiation, and selective wavelength filters. G.G.

N72-24404* Wisconsin Univ., Madison. Dept. of Civil Engineering.

AERIAL PHOTOGRAPHY FOR WATER RESOURCES STUDIES

Ralph W. Kiefer and James P. Scherz Aug. 1971 24 p refs Presented at ASCE Natl. Water Resources Eng. Meeting, Phoenix, Ariz., 11-15 Jan. 1971

(Grant NGL-50-002-127)

(NASA-CR-126629; Rept-6) Copyright. Avail: Wis. Univ., Madison, 351 Meteorology and Space Sci. Bldg.: HC $2.00 CSCL 08H

Airborne remote sensing using the photographic portion of the electromagnetic energy spectrum is considered. Illustrations are presented to show the use of color and color-infrared aerial photography to study siltation and algae growth in lakes, to map aquatic plants in lakes, to detect and monitor water pollution, and to study stream flooding. Author

N72-24405* Wisconsin Univ., Madison. Dept. of Civil Engineering.

REFLECTANCE AND TRANSMITTANCE CHARACTERISTICS OF SELECTED GREEN AND BLUE-GREEN UNIALGAE

Lorne C. Gramms, William C. Boyle, and Edmund R. Belak, Jr., ed. Jul. 1971 28 p refs

(Grant NGL-50-002-127)

(NASA-CR-126631; Rept-5) Copyright. Avail: Wis. Univ., Madison, 351 Meteorology and Space Sci. Bldg.: HC $2.00 CSCL 08A

Reflectance and transmittance characteristics were evaluated for two green algae, Selenastrum and Chlorella, and two blue-green algae, Microcystis and Anabaena, in the spectral region of 0.375 to 0.8 microns. Reflectance and transmittance properties were measured using a gammaspectrophotometer with a telescopic head attachment. The reflectance properties obtained were used to determine the feasibility of using selected wavelengths for differentiation between green and blue-green algae. Efforts were made to establish selected wavelengths and ratios which would delineate relative concentrations of the algal suspensions. Attenuation coefficients were calculated at selected wavelengths. The effects of nutrient level (uptake) and suspended particulates on reflectance and transmittance properties were also examined. Author

N72-24406 Maryland Univ., College Park.

ELECTRON HEATING PROCESSES IN THE MIDDLE IONOSPHERE Ph.D. Thesis

Tieh Chun Chang 1971 106 p

Avail: Univ. Microfilms Order No. 71-23975

The equilibrium distribution functions for electrons in the ionospheric plasma were calculated for the energy interval of 0+.15 ev, utilizing data collected in a pulse probe experiment, on board the sounding rocket NASA 18.12 which was launched from Wallops Island, Virginia into the normal daytime ionosphere. By using the densities and characteristic temperatures of

superthermal and thermal electrons, the electron heat input rates were calculated for the altitude range between approximately 120 and 240 km. The correlation between the electron heat input rates and the heat loss rates in this altitude range was studied. The equilibrium energy distributions of the secondary electrons in the middle ionosphere by solar ionizing radiation were calculated for electrons with energies less than 15 ev. A high energy electron distribution contributes the retarded probe current, which appears to be a linear function of the retarding probe potential. Dissert. Abstr.

N72-24407 Maryland Univ., College Park.
AN EXPERIMENTAL INVESTIGATION OF AN OPTICAL SOUNDING TECHNIQUE FOR ATMOSPHERIC OZONE **Ph.D. Thesis**
Jerome Raymond Bohse 1971 238 p
Avail: Univ. Microfilms Order No. 71-23971

The design and performance of a balloon-borne experiment to investigate and indirect technique for optical sounding for atmospheric ozone is discussed in detail. The experimental pay-load was designed to make a number of complementary measurements which allowed a maximum utilization of the indirect sounding technique and comparison with in situ measurements. The experimental system consisted of the following detection sub systems: (1) UV directional spectrophotometer, (2) solar aspect, (3) ground cover identification (4) cloud height detection, (5) environmental data, and (6) in situ ozone profile. The primary data are contained in five curves of atmospheric spectral radiance as viewed from above in the nadir direction. The data were used to obtain a cloud albedo of approximately 64% at 0.33 microns and to infer an ozone distribution similar to, the seasonal mean ozone distribution for the region of the flight. Dissert. Abstr.

N72-24408# Bureau of Mines, Denver, Colo. Intermountain Field Operation Center.
SATELLITE MONITORING OF OPEN PIT MINING OPERATIONS
William C. Henkes 1971 31 p
(BM-IC-8530) Avail: SOD $0.35

Anticipating the availability of space-altitude imagery from the Earth Resource Technology Satellites, the Bureau of Mines investigated the possibilities of using such imagery in its activities in solid waste disposal, reclamation of mine workings, and mineral resource inventory. The study indicates that monitoring open pit and strip-mining operations can be done using conventional techniques if the sharpness of the imagery is sufficiently high. Possibilities also exist for semi-automated processes for change detection. Author

N72-24409*# Florida Atlantic Univ., Boca Raton. Dept. of Geography.
SIMULATING AND INTERPRETING AERIAL OR ORBITAL TV OBSERVATIONS OF GEOGRAPHIC PATTERNS **Final Report**
James P. Latham Jan. 1972 118 p refs
(NASA Order R-09-020-024(A-1); NASA Order W-12570; Contract DI-14-08-0001-10936)
(NASA-CR-126254; USGS-DO-72-004; USGS-IR-NASA-223; TR-5) Avail: NTIS HC $8.00 CSCL 08F

Methods, techniques, instrumentation systems, and concepts or analyses developed by an investigation of the possibilities, problems, and applications of interpreting the geographic patterns recorded by orbital television observations of earth resources and land use are presented. A system of simulating orbital TV imagery by scanning astronaut-acquired photography and converting it to a TV monitor image was developed. Study of this TV imagery determined the feasibility for extracting and mapping geographic data and analyzed how the capability varied with changes in scan line intensity or image scale. Other studies established the feasibility of directly processing TV signals with a waveform and computer analysis technique that produces a printout category map of land use types, the use of waveform signal analysis to quantify the geographic patterns and identify phenomena recorded in color and color infrared aerial imagery, and the use of high altitude aerial photography to make a geographic region analysis or locate pollution. For individual titles, see N72-24410 through N72-24414.

N72-24410*# Florida Atlantic Univ., Boca Raton.
A SYSTEM FOR SIMULATING AERIAL OR ORBITAL TV OBSERVATIONS OF GEOGRAPHIC PATTERNS
James P. Latham *In its* Simulating and Interpreting Aerial or Orbital TV Observations of Geographic Patterns Jan. 1972 p 7-34 (See N72-24409 15-13)
Avail: NTIS HC $8.00 CSCL 08F

A system which simulates observation of the earth surface by aerial or orbiting television devices has been developed. By projecting color slides of photographs taken by aircraft and orbiting sensors upon a rear screen system, and altering scale of projected image, screen position, or TV camera position, it is possible to simulate alternatives of altitude, or optical systems. By altering scan line patterns in COHU 3200 series camera from 525 to 945 scan lines, it is possible to study implications of scan line resolution upon the detection and analysis of geographic patterns observed by orbiting TV systems. Author

N72-24411*# Florida Atlantic Univ., Boca Raton.
INTERPRETATION OF GEOGRAPHIC PATTERNS IN SIMULATED ORBITAL TELEVISION IMAGERY OF EARTH RESOURCES
James P. Latham, Clark I. Cross, William H. Kuyper, and Richard E. Witmer *In its* Simulating and Interpreting Aerial or Orbital TV Observations of Geographic Patterns Jan. 1972 p 35-84 (See N72-24409 15-13)
Avail: NTIS HC $8.00 CSCL 08F

In order to better determine the effects of the television imagery characteristics upon the interpretation of geographic patterns obtainable from orbital television sensors, and in order to better evaluate the influences of alternative sensor system parameters such as changes in orbital altitudes or scan line rates, a team of three professional interpreters independently mapped thematically the selected geographic phenomena that they could detect in orbital television imagery produced on a fourteen inch monitor and recorded photographically for analysis. Three thematic maps were compiled by each interpreter. The maps were: (1) transportation patterns; (2) other land use; and (3) physical regions. The results from the three interpreters are compared, agreements noted, and differences analyzed for cause such as disagreement on identification of phenomenon, visual acuity, differences in interpretation techniques, and differing professional backgrounds. Author

N72-24412*# Florida Atlantic Univ., Boca Raton.
COMPUTER LAND USE MAPPING VIA TV WAVEFORM ANALYSIS OF SPACE PHOTOGRAPHY
In its Simulating and Interpreting Aerial or Orbital TV Observations of Geographic Patterns Jan. 1972 p 85-89 (See N72-24409 15-13)
Avail: NTIS HC $8.00 CSCL 08B

An instrumentation and computer system which offers the potential for analyzing photogeographic distributions is described. To satisfy the requirement for computer acceptance, a television and waveform system was developed to transpose pictorial or iconic photo forms to the analytic. A video conversion was accomplished, and each pattern visible on the original photography was represented by a certain range of percentages. With spatial occurrences in digital form, a computer program was developed that could identify, analyze, and map geographic inputs. Author

N72-24413*# Florida Atlantic Univ., Boca Raton.
HIGH ALTITUDE COLOR PHOTOGRAPHY AS A TOOL FOR REGIONAL ANALYSIS: AS DEMONSTRATED FOR SOUTHEASTERN FLORIDA
L. Allan Eyre *In its* Simulating and Interpreting Aerial or Orbital

TV Observations of Geographic Patterns Jan. 1972 p 90-99 ref (See N72-24409 15-13)
Avail: NTIS HC $8.00 CSCL 08G

High altitude color and color infrared photography of the tri-county region of southeast Florida made it feasible to evaluate its potential for quantifying the dimensions of regional change. Attention was focused upon three main aspects of change in the region, which in fact overlap. These were; (1) the transformation of the southeast Florida wetlands; (2) the expansion of agriculture; and (3) the growth of the urbanized area. The development analyzed covered the period of thirteen years from 1956 to 1969. Results using this new 18 km photography were superior because of the degree of resolution, the combined power of color and color infrared interpretation, and the large area covered by each frame. The greatest advantage of high altitude imagery is the time-saving element, since it is possible to delineate and identify major geographic patterns over thousands of sq km very rapidly. Author

N72-24414*# Florida Atlantic Univ., Boca Raton.
REMOTE SENSING OF ENVIRONMENTAL DISTURBANCE
James P. Latham *In its* Simulating and Interpreting Aerial or Orbital TV Observations of Geographic Patterns Jan. 1972 p 100-103 Presented at Ann. Meeting of Southeast Div., Assoc. of Am. Geographers, Columbia, S. C., 23 Nov. 1970 (See N72-24409 15-13)
Avail: NTIS HC $8.00 CSCL 08F

Color, color infrared, and minus-blue films obtained by RB-57 remote sensing aircraft at an altitude of 60,000 feet over Boca Raton and Southeast Florida Earth Resources Test Site were analyzed for nine different types of photographic images of the geographic patterns of the surface. Results of these analyses are briefly described. Author

N72-24415*# Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
REMOTE SENSING AS A SOURCE OF DATA FOR OUTDOOR RECREATION PLANNING
Wallace E. Reed, H. Grant Goodell, and George D. Emmitt Jan. 1972 210 p refs Sponsored by NASA
(Contract DI-1-14-07-3)
(NASA-CR-126651; USGS-IR-NASA-233) Avail: NTIS HC $12.50 CSCL 08B

Specific data needs for outdoor recreation planning and the ability of tested remote sensors to provide sources for these data are examined. Data needs, remote sensor capabilities, availability of imagery, and advantages and problems of incorporating remote sensing data sources into ongoing planning data collection programs are discussed in detail. Examples of the use of imagery to derive data for a range of common planning analyses are provided. A selected bibliography indicates specific uses of data in planning, basic background materials on remote sensing technology, and sources of information on environmental information systems expected to use remote sensing to provide new environmental data of use in outdoor recreation planning. Author

N72-24416*# Techtran Corp., Glen Burnie, Md.
DEEP THERMAL STREAM IN THE DAGESTAN TERRITORY
A. S. Dzhamalova Washington NASA May 1972 126 p refs Transl. into ENGLISH of the book "Glubinnyy Tepl. Potok Na Territorii Dagestana" Moscow, Nauka Press, 1969
(Contract NASw-2037)
(NASA-TT-F-696) Avail: NTIS HC $3.00 CSCL 08G

Results are presented for a study of magnitude and variations of deep geothermal currents and the radiogenic component in sedimentary rock sections in the Dagestan A.S.S.R. The effect of structural conditions on thermal distribution is evaluated. Author

N72-24417# National Defense Research Organization TNO, The Hague (Netherlands). Physics Lab.
DESCRIPTION OF THE PLANNED EQUIPMENT TO MEASURE THE INFRARED TRANSMISSION AND EMISSION OF THE ATMOSPHERE
J. vanSchie and A. N. deJong Sep. 1971 18 p refs
(PHL-1971-40; TDCK-58754) Avail: NTIS HC $3.00

The planned experimental set-up of an infrared transmission and emission measurement program is described to be performed in the wavelength region from 2.5 to 15 microns Author

N72-24418# National Defense Research Organization TNO, The Hague (Netherlands).
THE AGREEMENT BETWEEN FIELD MEASUREMENTS OF VISIBILITY AND COMPUTED VISIBILITY BASED ON A DIGITAL TERRAIN MODEL
L. Kramer Feb. 1971 46 p refs In DUTCH; ENGLISH summary
(PHL-1971-7; TDCK-58607) Avail: NTIS HC $4.50

Coverage diagrams were computed for a number of observation points in Western Germany. These diagrams were checked against field-measurements which were carried out in the area from which the digitized terrain data had been obtained. Author

N72-24419# Institut d'Aeronomie Spatiale de Belgique, Brussels.
BASE FORMULAE FOR THE DETERMINATION OF THE ALTITUDE OF ARTIFICIAL CLOUDS [FORMULES DE BASE POUR LA DETERMINATION DE L'ALTITUDE DES NUAGES ARTIFICIELS]
H. Debehogne and E. VanHemelrijck 1972 37 p refs In FRENCH; ENGLISH summary
(Aeronomica-Acta-A-98) Avail: NTIS HC $4.00

Glowing clouds formed near 155 km and 275 km following the release of gaseous methane and oxygen were observed on photographs taken during the evening twilight. A detailed analysis of the altitude calculation is presented. Author

N72-24420*# Geological Survey, Washington, D.C.
LABORATORY AND AIRBORNE TECHNIQUES FOR MEASURING FLUORESCENCE OF NATURAL SURFACES
George E. Stoertz and William R. Hemphill 1972 28 p refs
(NASA Order L-58514; NASA Order T-80485C)
(NASA-CR-126895; USGS-IR-NASA-237) Avail: NTIS HC $3.50 CSCL 08G

Techniques are described for obtaining fluorescence spectra from samples of natural surfaces that can be used to predict spectral regions in which these surfaces would emit solar-stimulated or laser-stimulated fluorescence detectable by remote sensor. Scattered or reflected stray light caused large errors in spectrofluorometer analysis or natural sample surfaces. Most spurious light components can be eliminated by recording successive fluorescence spectra for each sample, using identical instrument settings, first with an appropriate glass or gelatin filter on the excitation side of the sample, and subsequently with the same filter on the emission side of the sample. This technique appears more accurate than any alternative technique for testing the fluorescence of natural surfaces. Author

N72-24421# Colorado Univ., Boulder.
A MODEL FOR PHOTOMORPHIC ANALYSIS TENNESSEE VALLEY TEST SITE
Donald D. MacPhail and Yuk Lee Feb. 1972 36 p refs
(USGS-236) Avail: NTIS HC $4.00

In order to determine the utility of the photomorphic concept of landscape analysis to the T.V.A. for use in regional planning, a model for analysis is necessary. The methodology and sampling techniques to be used in conjunction with a demonstration project utilizing the photomorphic concept include: identifying photomorphic patterns on black and white, intermediate-scale imagery; reducing these data to base map scale; selecting sample areas; and quantitatively measuring and testing the physical and cultural features such as drainage density, soil moisture, mean farm size, percent of vegetation cover, and population density to determine the validity of the photomorphic mapping. Author

N72-24422# Tennessee Univ., Knoxville.
DELINEATION OF INFORMATION REQUIREMENTS OF THE TVA WITH RESPECT TO REMOTE SENSING DATA
John B. Rehder Dec. 1971 22 p refs
(USGS-235) Avail: NTIS HC $3.25

The information needs and interests of T.V.A. that can be supplied by hyper-altitude imagery and future ERTS-A satellite imagery were determined by interviews. Two series of interviews were used to obtain specific data requirements as they pertain to the kinds of information expected and were particularly keyed to the topics of information needed, the variation of scales and coverage involved between aircraft and satellite platforms, and temporal considerations. Author

N72-24423# Oklahoma Univ., Norman.
BIBLIOGRAPHY OF REMOTE SENSING APPLICATIONS FOR PLANNING AND ADMINISTRATIVE STUDIES
Nelson R. Nunnally Dec. 1971 75 p refs
(USGS-234) Avail: NTIS HC $5.75

The annotated bibliography is representative of the material available, both published and unpublished and covers the entire spectrum of application in terms of methodology techniques and procedures, and all types of sensing systems. It is selective in that it attempts to present the best of articles covering the same applications, and to present different viewpoints. Author

N72-24424# Bureau of Mines, Denver, Colo.
A LEAST SQUARES METHOD FOR IMPROVING THE SOURCE LOCATION OF ROCK NOISE
Fred Leighton and Wilbur I. Duvall 1972 21 p refs
(BM-RI-7626) Avail: NTIS HC $3.25

The least squares method of rock noise source location is shown to be more accurate and reliable than standard direct solution methods. This method is particularly effective in improving solution from rock noise locations outside of geophone array boundaries. A least squares solutions for a medium in which the seismic velocity is the same in all directions is also presented. In this special case, one can solve for both the source coordinates and the velocity. Author

N72-24425# Committee on Public Works (U. S. Senate).
NATIONAL ENVIRONMENTAL LABORATORIES. PART 1: PROCEEDINGS
Washington GPO 1971 612 p refs Hearings on S. 1113 before Comm. on Public Works, 92d Congr., 1st Sess., 28-29 Apr. and 3-6 May 1971
Avail: SOD $2.50

Proceedings are presented of hearings held before the Senate Subcommittee on Air and Water Pollution concerning a bill to provide for education in ecological problems connected with environment degradation. K.P.D.

N72-24426# Committee on Public Works (U. S. Senate).
NATIONAL ENVIRONMENTAL LABORATORIES. PART 2: APPENDIX
Washington GPO 1971 916 p refs Appendix to Hearings on S. 1113 before Comm. on Public Works, 92d Congr., 1st Sess., Apr. - May 1971
Avail: SOD $3.00

For abstract, see N72-24425

N72-24427# Committee on Commerce (U. S. Senate).
OCEAN WASTE DISPOSAL
Washington GPO 1971 343 p Hearings on S. 307, S. 1082, S. 1238, and S. 1286 before Comm. on Com., 92d Congr., 1st Sess., 2-3 Mar., 15, 21-22, and 28 Apr. 1971
Avail: Subcomm. on Oceans and Atmosphere

The proceedings are presented for hearings on ocean waste disposal. Bills regulating the dumping of material in the oceans, coastal, and other waters are considered. K.P.D.

N72-24428# Joint Publications Research Service, Arlington, Va.
RADIOACTIVITY OF WATERS IN NORTHEASTERN PART OF ATLANTIC OCEAN
I. P. Baksheyeva, A. D. Zemlyanoy, V. N. Markelov, and B. A. Nelepo 18 Apr. 1972 14 p refs Transl. into ENGLISH from Okeanologiya (USSR), no. 6, Nov. - Dec. 1971, p 1041-1048
(JPRS-55743) Avail: NTIS HC $3.00

Artificial radioactivity studies were carried out in the northeastern Atlantic on the research vessel Mikhail Lomonosov in 1965 and 1966. Strontium 90 concentrations at the end of 1965 and the beginning of 1966 were higher than the average values for the whole ocean and amounted to about 50 disintegrations/minute/100 liters in the surface water layer. The most intensive transport of radioactive products from the Irish Sea was observed north- and northeastward along the Hebrides and Orkney Islands. Author

N72-24429# National Environmental Satellite Center, Hillcrest Heights, Md.
REDUCTION OF SATELLITE SOUNDING MEASUREMENTS
William L. Smith [1972] 6 p refs
Avail: NTIS HC $3.00

The problem of determining atmospheric temperature of N levels from radiance observations at M discrete frequencies is discussed. Two numerical solutions are considered, that of statistical regression and that of minimum information. These methods, considered to be optimum for the operational reduction of satellite data, exhibit comparable accuracy (root mean square errors of less than 2 K) except in the tropopause region and near the earth's surface. K.P.D.

N72-24430# National Oceanographic Data Center, Rockville, Md.
CATALOGUE OF ACCESSIONED SOVIET PUBLICATIONS, 1957 - 1968
Mar. 1971 388 p refs
Avail: NTIS HC $21.50

The catalog lists all articles contained in Soviet publication accessioned by World Data Center A, Oceanography, from 1957 through 1968. Suitable cross references are provided by means of keyword and author indexes. The publications and articles are grouped by institutions of origin. Author

N72-24431# National Environmental Satellite Center, Washington, D.C.
THE AIRBORNE ITPR BRASSBOARD EXPERIMENT
W. L. Smith, D. T. Hilleary, E. C. Baldwin, W. Jacob, H. Jacobowitz, G. Nelson, S. Soules, and D. Q. Wark Mar. 1972 79 p refs
(NOAA-TR-NESS-58) Avail: NTIS HC $6.00

A preprototype (brassboard model) infrared temperature profile radiometer (ITPR) was tested on the NASA Convair-990 aircraft during June 1970. The objectives of the airborne ITPR experiment were to obtain data to test various techniques planned for deriving temperature soundings from spaceborne ITPR measurements and to specify the transmission characteristics of the atmosphere and clouds. The instrument is described, and various results obtained from the airborne measurements are shown. Author

N72-24432# National Oceanic and Atmospheric Administration, Rockville, Md. Center for Experiment Design and Data Analysis.
BOMEX BULLETIN, NO. 11
Mar. 1972 85 p refs
Avail: NTIS HC $6.25

A bibliography is presented which lists all publications to date dealing with the Barbados Oceanographic and Meteorological Experiment. The bibliography is annotated and covers the following topics: (1) history, plans, general description of the program; (2) turbulent fluxes; (3) atmospheric budgets; (4) oceanography; (5) aircraft observations; (6) clouds; (7)aerosols, nuclei, and trace constituents in air and water; (8) the intertropical

convergence zone; (9) solar and IR radiation; (10) radar and lidar; (11) instrumentation; (12) surveys of results; and data inventories. Numerical model studies of air-sea interactions based on BOMEX data are described. A BLIP data inventory is included. K.P.D.

N72-24433# Michigan Univ., Ann Arbor. Aeronomy Lab.
PHOTOELECTRON FLUXES MEASURED AT MILLSTONE HILL
R. J. Cicerone and S. A. Bowhill [1971] 35 p refs
(Grants NSF GA-15526; NSF GA-27295)
Avail: NTIS HC $3.75

Measurements of the intensities of plasma lines in the radar incoherent-scatter spectrum are reported. The measurements were performed with the UHF radar at Millstone Hill, Massachusetts, on 9 February 1969. Theory of the plasma lines is reviewed and problems of data interpretation are discussed. The plasma-line intensities are interpreted in terms of photoelectron upward and downward flux components at 560 km. The net upward flux there is found to be 3.6 x 10 to the 8th power/cm2/sec. From the measured fluxes and a simplified picture of photoelectron transport, the escape flux and the arriving conjugate-point flux are found. In addition, the opacity of the protonospheric field tube connecting Millstone Hill and its conjugate-point is estimated as 0.85 for photoelectrons. Author

N72-24434# Michigan Univ., Ann Arbor. High Altitude Engineering Lab.
THE DISTRIBUTION OF TROPOSPHERIC INFRARED RADIATIVE FLUXES AND ASSOCIATED HEATING AND COOLING RATES IN THE SOUTHERN HEMISPHERE Ph.D.Thesis
Frank David Haurwitz Mar. 1972 183 p refs
(Grant NSF GA-10884; ORA Proj. 031640)
(Rept-031640-1-T) Avail: NTIS HC $11.25

Infrared flux calculations on the Southern Hemisphere for climatological conditions in January and July are presented. The results are given in terms of heating and cooling rates, fluxes at the top of the atmosphere, and net flux divergences for the entire atmospheric column. The 6.3 and 80 micron water vapor, the 15 micron carbon dioxide, and the 9.6 micron ozone bands are considered and transmission functions determined from the quasi-random band model, with the exception of the ozone band. The calculated transmissivities are compared to experimental values and fall within their experimental uncertainties. Author

N72-24435*# Techtran Corp., Glen Burnie, Md.
SOIL HEAT REGIME IN THE EUROPEAN USSR DURING THE WARM SEASON
N. I. Mikhaylova Washington NASA Jun. 1972 12 p refs
Transl. into ENGLISH from Tr. Nauchn.-Issled. Inst. Gidrometeorol. Priborostr. (Leningrad), no. 6, 1956 p 192-197
(Contract NASw-2037)
(NASA-TT-F-14299) Avail: NTIS HC $3.00 CSCL 08G

Using an equation for determining heat flux from the surface of the soil on the basis of thermal diffusivity integrated over time and depth, it is ascertained that approximately 40% of the radiation balance is absorbed in spring, 5 to 15% in May - June, 5 to 7% in July, and 1 to 3% in August. Author

N72-24436# Joint Publications Research Service, Arlington, Va.
SOME RESULTS OF MAGNETOTELLURIC PROFILING IN THE ARCTIC OCEAN
I. L. Trofimov and G. A. Fonarev 17 May 1972 5 p refs
Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Fiz. Zemli (Moscow), no. 2, 1972 p 81-82
(JPRS-56018) Avail: NTIS HC $3.00

Magnetotelluric profiling data is presented, which was gathered by a drifting station in the Lomonosov Ridge and Chukotskiy Arch areas. It was found that the geoelectric cross section of underwater structures in the Arctic Ocean is characterized by the presence of a layer with good conductivity and that total longitudinal conductivity of the sediment layer varies in a considerable range and is determined precisely by magnetotelluric profiling. Author

N72-24437# Ionospharen-Institut Breisach (West Germany).
IONOSPHERE DATA, VERTICAL-ECHO-SOUNDING: FREIBURG, URSI-CODE 131, FEBRUARY 1972 [IONOSPHAEREN-DATEN, VERTIKAL-ECHO-LOTUNG: FREIBURG, URSI-CODE 131, FEBRUAR 1972]
Feb. 1972 43 p ref In GERMAN and ENGLISH
(Rept-308-F) Avail: NTIS HC $4.25

Daily summaries are presented for vertical echo sounding of the upper atmosphere over Freiburg, Germany during February 1972. The data include charts of median values for the E and F regions, MUF(3000)F2, M(3000)F2, h'F2, hpF2, foF1, MUF(3000)F1, M(3000)F1, h'f, foE, FoE2, h'E, FoEs, fbEs, h'Es, Type Es, foT, and fmin. Author

N72-24438# Kyoto Univ. (Japan). University Library.
CATALOG OF DATA IN THE WORLD DATA CENTRE C2 FOR GEOMAGNETISM
Mar. 1972 29 p refs
Avail: NTIS HC $3.50

International Geophysical Year stations are classified in this listing according to geographic positions, geomagnetic coordinates, and geomagnetic elements. The geomagnetic coordinates are calculated on the basis of the dipole part of the International Geomagnetic Reference Field 1965.0. G.G.

N72-24439# National Defense Research Organization TNO, Rijswijk (Netherlands).
AN EXPERIMENTAL INVESTIGATION OF SHORT RANGE TURBULENT DIFFUSION IN THE ATMOSPHERE Final Report
C. J. P. vanBuijtenen Apr. 1970 68 p refs
(CL-1970-18; TDCK-58768-2) Avail: NTIS HC $5.50

Experimental investigations of short range turbulent diffusion in the atmosphere are discussed. A series of 100 diffusion experiments were conducted. Each experiment comprised an instantaneous as well as a continuous release. Two mathematical models are described, one for the continuous releases and a statistical model for instantaneous releases. It is concluded that the mathematical models provide acceptable correlation with the acquired data. Author

N72-24440# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
LOWER ORDOVICIAN CONODONTS FROM THE BONAPARTE GULF BASIN AND THE DALY RIVER BASIN, NORTHWESTERN AUSTRALIA
P. J. Jones 1971 105 p refs
(Bull-117) Avail: NTIS HC $7.25

The sequence of conodont species in the early Ordovician sediments of the Bonaparte Gulf Basin and the Daly River Basin in northwestern Australia is described. The assemblage zones erected by Druce and Jones for the Lower Ordovician of western Queensland are recognized and used to correlate the Lower Ordovician sediments both within the basin and between it, the Daly River Basin, and western Queensland. Intercontinental correlations are made on the basis of conodonts previously described from Asia, North America, and Europe. Author

N72-24441# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
THE STABILITY OF MAGNETISATION IN BASIC IGNEOUS ROCKS
P. M. Stott 1971 98 p refs
(Bull-129) Avail: NTIS HC $7.00

A special demagnetizing apparatus was constructed to study the stability of several samples of basic igneous rocks from three localites in eastern Australia, particular emphasis being

placed on the reliability of the directions of NRM. The direction of primary magnetization acquired when the rocks first cooled was determined for samples at all three sites. Mesozoic dolerite from Red Hill Dyke in southern Tasmania had little or no secondary magnetization and the mean direction of NRM was representative of the Jurassic in Tasmania. Devonian Nethercote basalt from southern New South Wales was divided into two distinct groups, one in which the NRM was completely unaffected in either direction or intensity by demagnetization in peak alternating fields of up to 1000 oersteds, and the other in which secondary magnetization completely masked any primary magnetization. Tertiary basalts from southern New South Wales showed a wide range of stability. The stability of the three rock types makes it probable that previous palaeomagnetic results, which span a long period from Devonian to Tertiary, form a reliable record of the geomagnetic field in Australia. Author

N72-24442# Aeronautical Chart and Information Center, St. Louis, Mo. Technical Translation Section.
MARINE GRAVIMETER WITH AUTOMATIC READING
V. A. Tulin and S. V. Osinskaya Jan. 1972 21 p refs Transl. into ENGLISH from the monograph "Apparatura i Metody Izmereniya Sily Tyazhesti na More" Moscow, 1970 p 93-101
(AD-738030; ACIC-TC-1787) Avail: NTIS CSCL 08/5

A schematic diagram of a two-stage gravimeter with an optical-mechanical reading converter is described. A design is given of a Cardan suspension, the use of which makes it possible to install the gravimeter in such a way that its own oscillations do not influence its reading. The article is supplemented with photographs of the automated gravimeter assembly designed for operation on a submarine. Author (GRA)

N72-24443# Environmental Research Corp., Las Vegas, Nev.
BASIC ASPECTS OF BPF, PSRV, AND FOURIER AMPLITUDE SPECTRA
Stephen S. Lane Jan. 1972 24 p refs
(Contract AT(29-2)-1163)
(NVO-1163-TM-16-Rev-1) Avail: NTIS

The Fourier spectrum, the band pass filter spectrum, and the pseudorelative velocity spectrum are common means of analyzing seismic data. A review of each frequency analysis technique is presented together with its uses, advantages, and disadvantages. For this purpose, the Fourier spectrum is taken to be the basic representation in the frequency domain.
Author (NSA)

N72-24444# Institut Royal Meteorologique de Belgique, Brussels.
IONOSPHERIC AND COSMIC RAY OBSERVATIONS Monthly Bulletin, Aug. 1971 [OBSERVATIONS IONOSPHERIQUES ET DU RAYONNEMENT COSMIQUE BULLETIN MENSUEL, AOUT 1971]
Aug. 1971 32 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Results of ionospheric and cosmic ray (neutron component) observations at Dourbes (Belgium) are tabulated for August 1971. Author (ESRO)

N72-24445# Institut Royal Meteorologique de Belgique, Brussels.
IONOSPHERIC AND COSMIC RAY OBSERVATION Monthly Bulletin, Sep. 1971 [OBSERVATIONS IONOSPHERIQUES ET DU RAYONNEMENT COSMIQUE BULLETIN MENSUEL, SEPTEMBRE 1971]
Sep. 1971 32 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Results of ionospheric and cosmic ray (neutron component) observations at Dourbes (Belgium) are tabulated for September 1971. Author (ESRO)

N72-24446# California Inst. of Tech., Pasadena. Seismological Lab.
VELOCITY GRADIENTS IN THE CONTINENTAL CRUST FROM HEAD-WAVE AMPLITUDES
David P. Hill 1971 6 p refs
(Contract F44620-69-C-0067; ARPA Order 1722)
(AD-736296; AFOSR-72-0268TR; Contrib-1914) Avail: NTIS CSCL 08/11

Small velocity gradients in a refracting horizon have a pronounced effect on the spectral amplitudes of head waves. Negative velocity gradients and anelasticity (Q sup -1) result in a similar amplitude decay with distance for narrow-bandwidth data. Positive velocity gradients result in a net amplitude gain with distance compared with the head wave from a homogeneous, perfectly elastic refractor. Wave-theoretical expressions for these effects applied to published amplitude data for the major crustal refraction branches. Author (GRA)

N72-24447# City Coll. Research Foundation, New York.
STRESS WAVE PROPAGATION THROUGH EARTH-WATER SYSTEMS Project Report no. 2
Carl J. Costantino Feb. 1972 63 p refs
(Contract DAHC19-69-C-0032; ARPA Order 1408)
(AD-738094; Rept-72-409-1) Avail: NTIS CSCL 08/13

The fundamental objective of this study is to develop numerical techniques to treat the general two-dimensional stress wave propagation problem through nonlinear earth materials including the effects of water flow through the earth materials. Topics discussed include the following: governing system equations; solution procedure; numerical results; one-dimensional elastic consolidation; triaxial elastic soil consolidation; triaxial Coulomb-Mohr model, and McCormick ranch sand model. GRA

N72-24448# RAND Corp., Santa Monica, Calif.
MECHANISM FOR BLOW-OFF OF THE EARTH'S ATMOSPHERE: POPULATION OF THE VAN ALLEN BELT
L. Marshall Libby Apr. 1971 23 p refs
(AD-738064; P-4631) Avail: NTIS CSCL 04/1

Rate of loss of terrestrial atmosphere from earthquake motions is estimated. Some of this atmosphere ionizes as it is blown off through the magnetosphere, and the amount so ionized seems to be abundantly ample to account for C, N, and O found in the Van Allen Belt. Author (GRA)

N72-24449# Rochester Univ., N.Y.
BARIUM CLOUD DENSITY VARIATION IN A HIGHLY CONDUCTING BACKGROUND Semiannual Technical Report, 15 Sep. 1970 - 14 Mar. 1971
Albert Simon and Arthur M. Sleeper Mar. 1971 29 p refs
(Contract F30602-70-C-0001; ARPA Order 1057)
(AD-732880; RADC-TR-71-106) Avail: NTIS CSCL 04/1

An equation is derived for the growth in time of a barium cloud in a strongly conducting background. The expression is correct to first order in an expansion in powers of the ratio of the cross-cloud conductivity to the background conductivity. Numerical solutions of this equation indicate significant differences from the zero order result. There is steepening of the backside of the cloud and elongation in the E X B direction. The list of weakly ionized instabilities is extended to include the true gravitational instability. This is the closest contender to the E X B but still appears to have a threshold higher by about a factor of ten. Author (GRA)

N72-24450# Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
RESEARCH IN SEISMOLOGY Final Report, 1 Nov. 1965 - 31 Mar. 1971
Frank Press, M. Toksoz, and Keiiti Aki 31 Dec. 1971 67 p refs
(Contract AF 49(638)-1632; ARPA Order 292; Proj. Vela-Uniform; AF Proj. 6270)
(AD-737135; AFOSR-72-0373TR) Avail: NTIS CSCL 08/11

A brief summary of the research efforts under this contract is provided. The areas of investigation fall under five categories:

seismic wave propagation in heterogeneous media; seismic source theory; study of structure, properties and heterogeneities of the earth's interior; utilization of seismic arrays; development and performance of long-period tiltmeters. Author (GRA)

N72-24451# California Univ., Riverside.
COASTAL AND SHORE LANDFORMS OF BAJA CALIFORNIA DEL NORTE, MEXICO
Jack B. Bale and John A. Minich Aug. 1971 83 p
(Contract N00014-69-A-0200-5003; NR Proj. 387-045)
(AD-736966; TR-O-71-2) Avail: NTIS CSCL 08/6

A series of seventeen maps is presented of the coastal and shore morphology of the northern half of the peninsula of Baja California. A total of 38 classes of both shoreward and landward categories are descriptively employed to cartographically display information interpreted from uncontrolled oblique aerial photographs to existing base maps. Thirty-six examples of color infrared oblique aerial photographs used in the analysis are presented. The greatest difficulty encountered was lack of critical ground control on the photography which necessitated interpretation and resectioning of data onto small scale (1:200,000) maps. Author (GRA)

N72-24452# Army Engineer Topographic Labs., Fort Belvoir, Va.
A PRACTICAL SECOND-ORDER THEORY FOR THE DISTURBANCE POTENTIAL AND DEFLECTIONS OF THE VERTICAL INCLUDING AN ANALYSIS OF THE LIMITATIONS OF THE MOLODENSKY/BROVAR SERIES AND DOWNWARD CONTINUATION OF GRAVITY
Hans G. Baussus-VonLuetzow Mar. 1971 20 p refs
(AD-737175; ETL-RN-71-1) Avail: NTIS CSCL 08/5

The theory presented here is an extension of the work by Pellinen, Moritz, and the author, which involves terms determined from the earth's topography and no isostatic assumptions. It is shown that the series developments by Molodensky, Brovar, and Moritz neither lead to optimal nor to most convenient solutions and should be replaced in practical computations. The planar solution presented is accurate and simple in nature and particularly well-suited for calculations of deflections of the vertical. Author (GRA)

N72-24453# Naval Research Lab., Washington, D.C.
COMPUTER SIMULATION OF WHISTLER TURBULENCE AND PARTICLE PITCH ANGLE DIFFUSION IN COLLISIONLESS PLASMA
S. L. Ossakow, I. Haber, and E. Ott Nov. 1971 14 p refs
(AD-737628; NRL-MR-2378) Avail: NTIS CSCL 04/1

Particle-code computer simulations are used to study whistler turbulence in collisionless plasmas driven by initially anisotropic bi-Maxwellian and loss cone electron distributions. Linear growth of magnetic energy is observed to saturate when the growth rate is of the order of the particle trapping frequency. Isotropization of the particle distribution is studied and phase space plots clearly illustrating particle pitch angle diffusion are presented. Author (GRA)

N72-24454# Rice Univ., Houston, Tex. Dept. of Geology.
DEVELOPMENT OF REMOTE METHODS FOR OBTAINING SOIL INFORMATION AND LOCATION OF CONSTRUCTION MATERIALS USING GAMMA RAY SIGNATURES Semiannual Report
J. A. S. Adams, H. C. Clark, R. B. Clark, J. S. Duval, T. F. Schwarzer, and J. M. Worden 31 Dec. 1971 182 p refs
(Contract DACA39-69-C-0048; Proj. Themis)
(AD-737717) Avail: NTIS CSCL 08/7

Contents: Experimental comparison of NaI(T1) and solid organic scintillation detectors for use in remote sensing of terrestrial gamma rays; Hydrologic investigations and the significance of U-234/U-238 disequilibrium in the ground waters of central Texas; Radon emanation investigations; Computer simulation and a simple approach to some topographical considerations; The discrimination of rock and soil types via low altitude airborne gamma-ray spectrometry in Payne County, Oklahoma. GRA

N72-24455# Avco-Everett Research Lab., Everett, Mass.
BOUNDARY LAYER INTERFERENCE CALCULATIONS Final Report
G. M. Daniels, L. A. Popper, K. L. Wray, and L. A. Young Jul. 1971 22 p refs
(Contract F04701-71-C-0033; ARPA Order 1092)
(AD-737555; SAMSO-TR-72-16) Avail: NTIS CSCL 04/1

This is a final report on Avco Everett Research Laboratory's study on Boundary Layer Interference Calculations. In the program the infrared radiation from 3 - 20 microns emanating from the ablating boundary layer of a reentering vehicle was calculated down to 100 kft. It was found that the radiation was dominated by ambient CO2 and H2O and air shock produced NO down to 150 kft at which altitude ablation product radiation began to become important. The results of these calculations were compared with various sources of earth radiation including earth surface, atmosphere, and scattered sunlight. CO radiation at 4.3 microns from the boundary layer was found to have a higher radiance than the earth at 100 kft. Author (GRA)

N72-24456# Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Applied Mathematics.
SEISMIC SOURCE IDENTIFICATION TECHNIQUES Final Scientific Report, 1 May 1966 - 28 Feb. 1971
Ari Ben-Menahem 29 Jun. 1971 34 p refs
(Contract AF 61(052)-954; ARPA Order 292-77; AF Proj. 8652)
(AD-737786; AFCRL-71-0547) Avail: NTIS CSCL 08/11

Research activities within the framework of this contract are documented in twenty-six scientific papers, twenty-one of which were already published in various scientific journals. The rest are in press. Other activities are the preparation of a comprehensive library of computer programs for various fields of endeavor in theoretical and experimental seismology and the establishment of a modern geophysical observatory near Eilat, Israel, which includes strainmeters, tiltmeters and high-gain displacement-meters. Author (GRA)

N72-24457# Technology International Corp., Bedford, Mass.
AIRBORNE PHOTOGRAPHIC MEASUREMENTS OF NATURAL AURORA, 1970-1971 Final Report, 1 Jun. 1970 - 1 Jul. 1971
R. W. Deuel and W. P. Boquist Jul. 1971 20 p
(Contract F19628-70-C-0277; AF Proj. 5710)
(AD-737788; TIC-724; AFCRL-71-0480) Avail: NTIS CSCL 04/1

Photographic measurements of faint auroral phenomena were made from AFCRL KC-135 No. 53120 during the fall-winter of 1970-71. As a partial objective of the project, instrumentation was developed to provide wide field of view (30 degrees -45 degrees) coverage with less than f/1 objective optics on a 70 mm film format. Extensive color and black and white records were obtained for AFCRL using this instrumentation during the February-March auroral flight missions, showing the detailed morphological development of highly striated aurora. Author (GRA)

N72-24458# Ghana Univ., Legon. Dept. of Physics.
IONOSPHERIC RESEARCH USING SATELLITES: EQUATORIAL SCINTILLATION, 1 MARCH - 31 DECEMBER 1970
John R. Koster Sep. 1971 85 p refs
(Contract F61052-70-C-0004; AF Proj. 4643)
(AD-737790; AFCRL-71-0609; SR-1) Avail: NTIS CSCL 04/1

Previous work on ionospheric scintillation done at Legon, Accra, Ghana, is summarized, and smoothed curves are given showing the seasonal variation of scintillation for the parts of 4 successive years (1967 to 1970) for which records were obtained. It is shown that nights of much reduced scintillation

are also nights of unusually high values of Faraday rotation angle. There is a statistically significant reduction of scintillation on nights of magnetic disturbance characterized by a high value of the K sub p index. Scintillation data from Legon, Ghana, and Huancayo, Peru, are compared over a six month period. Present knowledge of the convective motion of field lines in the magnetosphere are reviewed, and equatorial scintillation is shown to be closely associated with that motion. Author (GRA)

N72-24459# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
ATMOSPHERIC STRUCTURE AND ITS VARIATIONS IN THE REGION FROM 25 TO 120 kM
Gerald V. Groves 27 Jul. 1971 175 p refs
(AF Proj. 8605)
(AD-737794; AFCRL-71-0410; AFCRL-ERP-368) Avail: NTIS CSCL 04/1

The report has been prepared as part of the activities of the Committee on Space Research (COSPAR) panel on a new reference atmosphere, which will aid in the design of aircraft, missiles and satellites. It combines a review of observational results obtained over approximately the last six years on temperature, pressure, density and winds with new models for the seasonal and latitudinal dependence of these parameters at heights from 25 km to the lower thermosphere. The temperature, pressure and density models extend from 25 to 110 km and are identical with those previously given. W-E wind models are presented separately for the regions 25 to 60 km and 60 to (approximately) 120 km. Three W-E wind models from 25 to 60 km are presented corresponding to N. American data, European/W. Asian data, and S. Hemisphere data. A model for the quasi-biennial oscillation in W-E winds at low latitudes is given. Other variations, such as diurnal (tidal) variations, and S-N winds are dealt with in the review of observational data.
Author (GRA)

N72-24460# GCA Corp., Bedford, Mass. Technology Div.
A BALLOON-BORNE AEROSOL COUNTER Final Report, 17 Apr. 1970 - 20 Nov. 1971
Henry A. Miranda, Jr. and John Dulchinos Jan. 1972 71 p refs
(Contract F19628-70-C-0265; AF Proj. 7621)
(AD-737802; GCA-TR-71-3-A; AFCRL-71-0416) Avail: NTIS CSCL 04/1

A balloon-borne aerosol counter which samples and sizes individual particles to an accuracy of plus or minus 10 percent over an order of magnitude size range extending down to 0.1 - 0.2 micron diameter regime, has been successfully flown. The device is completely self-contained and recoverable. The data are recorded on 9-channel magnetic tape in digital format compatible with an IBM 360 computer, and are processed automatically. Stratospheric aerosol size distributions have been obtained in increments of one and two kilometers, up to and including balloon float altitudes (above 23 km). These represent the first such direct information available, and are presented here in preliminary form. A description of the device, together with a discussion of calibration and automatic data reduction procedures, as well as recommendations for improvements in the latter, is given. Author (GRA)

N72-24461# Calcutta Univ. (India). Inst. of Radio Physics and Electronics.
STUDIES ON IONOSPHERIC ELECTRON CONTENT AND IRREGULARITIES OF ELECTRON CONCENTRATION AT LOW LATITUDES Final Scientific Report, 1 Oct. 1967 - 30 Sep. 1970
J. N. Bhar, A. DasGupta, and S. Basu Sep. 1971 94 p refs
(Contract F61052-68-C-0008; AF Proj. 4643)
(AD-737806; AFCRL-72-0025) Avail: NTIS CSCL 04/1

The low latitude ionosphere has a special character of its own owing to a strong control of geomagnetic field over the topside ionosphere. In order to explore the extent of this control, studies on total electron content and irregularities of electron concentration in the ionosphere were carried out at Haringhata Field Station (22 degrees 58 minutes N, 88 degrees 30 minutes E). The investigation on electron content were mainly oriented towards the determination of its latitude variation under varying geomagnetic conditions while those on the irregularities sought to obtain their axial ratio and spatial distribution. Author (GRA)

N72-24462# Aeronautical Chart and Information Center, St. Louis, Mo. Technical Translation Section.
OPTICAL ANGLE MEASURING ATTACHMENT TO THE TEST STAND FOR CALIBRATION OF QUARTZ GRAVIMETERS BY THE TILT METHOD
P. A. Bocharnikov Feb. 1972 9 p Transl. into ENGLISH from the publ. "Apparatura i Metody Izmereniya sily Tyazhestina More" Moscow, Nauka, 1970 p 153-155
(AD-738076; ACIC-TC-1793) Avail: NTIS CSCL 08/5

The article contains the description of a new method for determination of the deflection angle of the plate of a test stand for calibration of gravimeters by tilting. It permits the measurement of angles within the limits of several degrees, with an error providing calibration in the range of plus or minus 100 mgal with an accuracy of plus or minus 0.01 mgal. The method is based on a null circuit for measuring the tilt angle of the test stand's plate by increasing the measured angle and, consequently, the permissible measurement error, with the aid of a triple-mirror multiplier, which is the main assembly of an optical attachment, where in addition there is an ADT-1000 autocollimator and a reading device of the type of the OT-02 theodolite's horizontal circle. The indicated method permits measurement of the tilt angle directly in angular measure, with an accuracy that exceeds the accuracy of goniometers in use at present. Author (GRA)

N72-24463# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
INTERDISCIPLINARY MONITORING OF THE NEW YORK BIGHT
W. G. Egan, J. M. Cassin (Adelphi Inst. of Marine Sciences), and M. E. Hair (Adelphi Inst. of Marine Sciences) Jan. 1972 15 p refs Submitted for publication
(AD-737506; RM-534J) Avail: NTIS CSCL 08/10

Interdisciplinary physical, chemical and biological measurements were made in the New York Bight during 1969-70 using new in situ instrumentation, with associated monitoring by conventional procedures to check the performance. In situ instrumentation was found to be feasible for the measurement of chlorophil (and the related biomass), bioluminescence, Gelbstoff, pH, dissolved O2, salinity, and the location of the thermocline. It appears that the in situ instrumentation may be adapted to continuous synoptic monitoring of the estuarine and oceanographic parameters necessary for mathematical modeling.
Author (GRA)

N72-24464# Naval Electronics Lab. Center, San Diego, Calif.
SIGNAL PHASE AND MAGNETIC INDEX (K SUB P) IN TRANS-AURORAL OMEGA PROPAGATION
R. H. Gimber and I. J. Rothmulller 30 Jun. 1971 16 p refs
(AD-738023; NELC-TR-1779) Avail: NTIS CSCL 04/1

The extent of the visual auroral zone had been shown to depend on magnetic index (K sup p), and it was thought that correlation could exist as well between the vlf auroral zone and (K sup p). Analysis shows that the dependence is weak at most. A possible conclusion is that the observed phase fluctuation depends more on localized variation of the ionosphere within the auroral zone than on variation in the extent of the auroral zone.
Author (GRA)

N72-24465# California Inst. of Tech., Pasadena. Seismological Lab.
SEISMIC PHENOMENA CONNECTED WITH EARTHQUAKES AND EXPLOSIONS
Don L. Anderson Oct. 1971 34 p refs

(Contract F44620-69-C-0067; ARPA Order 292; ARPA Order 1722)
(AD-737541; AFOSR-72-0492TR) Avail: NTIS CSCL 08/11

Structural studies have yielded important results in two general areas: a high resolution mean earth model has been determined through the inversion of a very large quantity of free oscillation, surface wave and body wave data. This model gives especially detailed information concerning the lower mantle and the core of the earth; and secondly, through a variety of new techniques, details of the structure of the transition zones in the upper mantle and their lateral variability and similar results for crust and upper mantle structure, have been determined especially within the continental United States. Author (GRA)

N72-24466# Philco-Ford Corp., Billings, Mont. Communications and Technical Services Div.
MONTANA LARGE APERTURE SEISMIC ARRAY VELA-UNIFORM Technical Report, 1 Dec. 1970 - 30 Nov. 1971
Robert E. Matkins 22 Dec. 1971 148 p refs
(Contract F33657-71-C-0430; ARPA Order 1620; AF Proj. 1620; Proj. Vela-Uniform)
(AD-738003; TR-2039-71-13) Avail: NTIS CSCL 17/10

The technical activity associated with the operation, maintenance, and improvement of the Montana Large Aperture Seismic Array (LASA) during the period 1 December 1970 - 30 November 1971 is related in this report. The philosophy for array system performance measurement is discussed and performance statistics and measurements indicated for certain equipment. Some new superficial noise sources are identified. The number of failures is reported for each equipment type. Development of a new PDP-7 computer operating system with supporting programs for automatic maintenance and monitoring of selected array equipments is described. Author (GRA)

N72-24467# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CHARACTERISTICS OF SEISMIC WAVES IN NUCLEAR EXPLOSIONS AND EARTHQUAKES
I. P. Pasechnik 1 Feb. 1972 344 p refs Transl. into ENGLISH of "Kharakteristiki Seismicheskikh Voln pri Yadernykh Vzryvakh i Zemletryaseniyakh" USSR, 1970 p 1-191
(Contract F33657-71-D-0057; AF Proj. 1256)
(AD-737870; FTD-HC-23-721-71) Avail: NTIS CSCL 08/11

Examined are the kinetic and dynamic characteristics of volume and surface seismic waves excited by nuclear explosions in various media. Investigated is the level and spectral compositions of microseisms in various seismogeological regions; discussed is also the question concerning the choice of optimum parameters of seismic equipment. Shown are possibilities of using the data obtained at explosions for the study of the internal structure of the earth. Author (GRA)

N72-24468# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
NOTE ON A TRAVELING IONSPHERIC DISTURBANCE
S. M. Silverman and T. F. Tuan 16 Dec. 1971 15 p refs
(AD-738324; AFCRL-71-0603; AFCRL-ERP-378) Avail: NTIS CSCL 04/1

The traveling ionospheric disturbance of 13 May 1964, discussed by Thome (1968), appears to have had unusually high amplitude and would seem well-suited for further investigation into its possible extension into the Southern Hemisphere as well as the possible presence of a simultaneous north-bound wave. With f-plot data, supported by tabulated hourly values as well as, in some cases, the actual ionogram, the authors have found some evidence for an extension of the wave into the Southern Hemisphere with a phase of 180 deg in accordance with Thome's predictions. Preliminary investigations into a north-bound wave seem to reveal a disturbance traveling at approximately the same velocity as the south-bound traveling ionospheric disturbance. Author (GRA)

N72-24469# GCA Corp., Bedford, Mass. Technology Div.
TMA PAYLOAD, FIELD SERVICES AND DATA REDUCTION Final Report, 7 Nov. 1967 - 31 May 1971
John F. Bedinger and Eustratios Constantinides Feb. 1972 28 p refs
(Contract F19628-68-C-0137)
(AD-737835; GCA-TR-71-4-A; AFCRL-71-0564) Avail: NTIS CSCL 04/1

A TMA payload was constructed and launched from the Eglin Test Range in Florida. Wind data were obtained with a stereo method of analysis from photographs taken at two closely spaced sites. Optical sites were established also at other locations in Florida to observe a vapor trail during the solar eclipse of 7 March 1970, but observations were prevented due to complete cloud cover at the sites. Optical sites were operated during the summer and fall of 1969 at Ft. Churchill, Canada for the observation of chemical release. A measurement of the electric field was obtained from observation of barium release and a wind profile was obtained from TMA release. Author

N72-24470# Texas Instruments, Inc., Dallas. Services Group.
UTILITY OF TSAI'S METHOD FOR SEISMIC DISCRIMINATION Semiannual Report, 1 Jul. - 31 Dec. 1971
Yi-Ben Tsai 15 Jan. 1972 42 p refs
(Contract F44620-71-C-0112; ARPA Order 1827)
(AD-738329; AFOSR-72-0516TR; SATR-1) Avail: NTIS CSCL 17/10

The objective of the program is to study how the surface wave spectral analysis technique can be most effectively exploited to discriminate between earthquakes and underground nuclear explosions. The observed surface wave spectra are often contaminated by modulations caused by interference due to multipath propagation. These spectral modulations are not related to the characteristics of the seismic source, which is the prime concern, and so, our first task is to find an effective means for removing the undesirable modulations of the spectra.
Author (GRA)

N72-24471# Army Engineer Topographic Labs., Fort Belvoir, Va.
IMAGE-PROCESSING PRECISION AS AFFECTING RELATIVE ORIENTATION
M. A. Crombie Dec. 1971 35 p
(DA Proj. 4A6-62707-A-852)
(AD-737673; ETL-RN-71-6) Avail: NTIS CSCL 09/2

Formulas which represent errors in relative orientation parameters determined by least squares are presented. The parametric errors are expressed as functions of format size, focal length, percentage of overlap, number of measured images, and the experimental error. The analysis pertains to vertical photography; a numerical example is provided. Author (GRA)

N72-24472# Aeronautical Chart and Information Center, St. Louis, Mo. Technical Translation Section.
OPTICAL POLARIZATION CIRCUIT FOR RECORDING SMALL ANGLES OF ROTATION WITH A DEVICE FOR CALIBRATION OF PARAMETERS OF THE MEASUREMENT CHANNEL
V. N. Seleznev and L. G. Ivankin Feb. 1972 9 p ref Transl. into ENGLISH from the publ. "Apparatura i Metody Izmereniya sily Tyazhesti na More" Moscow, Nauka, 1970 p 157-160
(AD-738407; ACIC-TC-1795) Avail: NTIS CSCL 08/5

A description is given of an optical polarization circuit for registering angles of rotation of 10 to the minus 7th power to 10 to the minus 4th power rad, with low sensitivity to small linear displacements. The circuit provides for setting up a half-wave phase plate for receiving the calibration signal. The circuit is useful in the expedition apparatus. Author (GRA)

N72-24473# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
STUDYING THE SLIDE PATTERN OF AVALANCHES BY

MEANS OF PHOTOGRAMMETRIC METHODS
Marcel Kahn Jan. 1972 12 p Transl. into ENGLISH from Axel Heiberg Expedition, McGill Univ., Canada, 1964
(AD-737810; CRREL-TL207) Avail: NTIS CSCL 08/12

Contents: The slide of avalanches; Photogrammetric arrangement of the study; The site for the experiment; Work plan. GRA

N72-24474# Aeronautical Chart and Information Center, St. Louis, Mo.
STANDARD PRINTING SCREEN SYSTEM
Otto C. Stoessel Feb. 1972 49 p
(AD-737831; ACIC-TR-72-1) Avail: NTIS CSCL 14/5

The Standard Printing Screen (SPS) System adopted by the Department of Defense for its Mapping, Charting, and Geodesy (DOD-MC-G) agencies, is described. It establishes a system of dot screens with visual tones of equidistant increments as viewed by an average observer. The system includes the full range of tints, from paper white (0% tone) to solid color (100% tone). The report includes the standardization of dot, bi-angle, line pattern and area pattern screens. It also describes the creation of a 100-step continuous growth halftone scale for the purpose of specifying quality control tolerances of screen tints for the printed product. Author (GRA)

N72-24475# Woods Hole Oceanographic Institution, Mass.
THE DISTRIBUTIONS OF TEMPERATURE, SALINITY, AND SOUND VELOCITY IN THE WESTERN IONIAN SEA DURING SPRING, 1968
Arthur R. Miller Jan. 1972 96 p refs
(Contract N00014-71-C-0057; NR Proj. 292-047)
(AD-737695; WHOI-Ref-72-5) Avail: NTIS CSCL 08/10

A frontal zone has been demonstrated in the descriptions of the properties which separate a relatively stagnant area from a dynamically active area. This is a result of flow from the west through the Strait of Sicily carrying with it water fresher than 38.5%. The temperature differences are not very great, however, and with the general latitudinal flow there is probably no season with pronounced temperature change as opposed to the Ionian Sea which receives the flow. From 36 deg 10 min N. to 36 deg 30 min N. high salinity, or Levantine Intermediate Water, encroaches upon the shelf at the entrance to the Sicilian passage between Malta and Sicily. Probably this indicates the source and the path of the supply of Levantine Intermediate Water to the Western Mediterranean. Author (GRA)

N72-24879# Joint Publications Research Service, Arlington, Va.
OCEANOGRAPHY
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 275 9 May 1972 p 22-40 (See N72-24876 15-30)
Avail: NTIS HC $6.75

N72-24880# Joint Publications Research Service, Arlington, Va.
TERRESTRIAL GEOPHYSICS
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 275 9 May 1972 p 41-56 (See N72-24876 15-30)
Avail: NTIS HC $6.75

N72-24881# Joint Publications Research Service, Arlington, Va.
UPPER ATMOSPHERE AND SPACE RESEARCH
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 275 9 May 1972 p 57-83 (See N72-24876 15-30)
Avail: NTIS HC $6.57

14 INSTRUMENTATION AND PHOTOGRAPHY

Includes design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gages; recorders; transducers; aerial photography; and telescopes and cameras.

N72-24476 Ohio State Univ., Columbus.
ANALYTIC PHOTOGRAMMETRY: A COLLINEAR THEORY Ph.D. Thesis
Lee Uhrig Bender 1971 165 p
Avail: Univ. Microfilms Order No. 71-22449

A collinear theory of photogrammetry is developed through the employment of homogeneous coordinates and generalized matrix inverses. Abbe's theory of optical instruments is introduced as the foundation upon which the present theory is built. The distinguishing facit of Abbe's theory is its basic postulate which asserts that there exists a one-to-one relationship between the object and its image. Through this postulate one arrives at the conclusion that a three dimensional, non-singular projective transformation (collineation) relates object and image. The photograph as a singular collineation is interpreted as (1) a finite plane of discontinuity which includes the ESSA model, the nine-parameter perspective model, and the rectification model as examples: and (2) an infinite plane of discontinuity, which embraces the axonometry. Dissert. Abstr.

N72-24477* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THERMODIELECTRIC RADIOMETER UTILIZING POLYMER FILM Patent
Benjamin H. Beam and Larry D. Russell, inventors (to NASA)
Issued 18 Apr. 1972 7 p Filed 12 Nov. 1968
(NASA-Case-ARC-10138-1; US-Patent-3,657,644;
US-Patent-Appl-SN-774733; US-Patent-Class-324-61R;
US-Patent-Class-73-355R; US-Patent-Class-250-83.3H;
US-Patent-Class-317-247) Avail: US Patent Office CSCL 14B

A thermodielectric radiometer employing a polymer film or a capacitor dielectric is described. The film is charged to a suitable voltage gradient and, when it is heated by absorbed radiation, it produces a proportional open circuit voltage increment which can be measured to provide an indication of the total energy or power of a short duration pulse of radiant flux.
Official Gazette of the U. S. Patent Office

N72-24478*# Lockheed Missiles and Space Co., Palo Alto, Calif.
DEVELOPMENT OF TECHNIQUES AND ASSOCIATED INSTRUMENTATION FOR HIGH TEMPERATURE EMISSIVITY MEASUREMENTS Quarterly Progress Report, 29 Dec. 1971 - 28 Mar. 1972
G. R. Cunnington and A. I. Funai 28 Mar. 1972 36 p
(Contract NAS8-26304)
(NASA-CR-123647; N-JF-72-2-QPR-6; TP-3366; QPR-6) Avail: NTIS HC $4.00 CSCL 14B

The progress during the sixth quarterly period is reported on construction and assembly of a test facility to determine the high temperature emittance properties of candidate thermal protection system materials for the space shuttle. This facility will provide simulation of such reentry environment parameters as temperature, pressure, and gas flow rate to permit studies of the effects of these parameters on the emittance stability of the materials. Also reported are the completed results for emittance tests on a set of eight Rene 41 samples and one anodized titanium alloy sample which were tested at temperatures up to 1600 F in vacuum. The data includes calorimetric determinations of total hemispherical emittance, radiometric determinations of total and spectral normal emittance, and pre- and post-test room temperature reflectance measurements. Author

N72-24479*# Arkansas Univ., Little Rock.
A SYMMETRICAL LASER DOPPLER VELOCITY METER AND ITS APPLICATION TO TURBULENCE CHARACTERIZATION Graduate Inst. of Technology.
M. K. Mazumder Washington NASA May 1972 106 p refs
(Grant NGL-04-001-007)
(NASA-CR-2031) Avail: NTIS HC $3.00 CSCL 20D

A symmetrical method of optical heterodyning of the Doppler shifted scattered laser radiation developed for velocity measurements with a minimal instrumental spectral broadening and a high signal-to-noise ratio. The method employs two laser beams incident on the moving scatterer and does not use any reference beam for heterodyning. The Doppler signal frequency is independent of the scattering angle and the signal possesses no receiving aperture broadening. Optical alignment is simple. Typical values of the instrumental spectral broadening were approximately 0.8 percent of the center frequency of the Doppler signal, and the signal-to-noise ratio was approximately 25 dB, obtained from an air flow system using submicron dioctylphthalate scattering aerosol. Experimental and theoretical studies were made on the characteristics of the Doppler signal and the effect of system parameters in turbulent flow measurement. The optimization process involved in the beam optics and in the use of a spatial filter is described. For localized flow measurement in any direction of the three-dimensional orthogonal coordinates, the system, using uncorrected optical components, had a sensing volume which can be described by a sensitive length of 600 microns and a diameter of 100 microns. Author

N72-24480*# Chrysler Corp., New Orleans, La. Space Div.
DESIGN AND TESTING OF A MAGNETIC SUSPENSION AND DAMPING SYSTEM FOR A SPACE TELESCOPE Final Technical Report
Norman J. Ockman May 1972 91 p refs
(Contract NAS1-10776)
(NASA-CR-112061) Avail: NTIS HC $6.75 CSCL 14B

The basic equations of motion are derived for a two dimensional, three degree of freedom simulation of a space telescope coupled to a spacecraft by means of a magnetic suspension and isolation system. The system consists of paramagnetic or ferromagnetic discs confined to the magnetic field between two Helmholtz coils. Damping is introduced by varying the magnetic field in proportion to a velocity signal derived from the telescope. The equations of motion are nonlinear, similar in behavior to the one-dimensional Van der Pol equation. The computer simulation was verified by testing a 264-kilogram air bearing platform which simulates the telescope in a frictionless environment. The simulation demonstrated effective isolation capabilities for disturbance frequencies above resonance. Damping in the system improved the response near resonance and prevented the build-up of large oscillatory amplitudes. Author

N72-24481# Signals Research and Development Establishment, Christchurch (England).
THE USE OF AN X-RAY SOURCE IN THE OPTICAL SPECTROSCOPY OF RARE EARTH DOPED IONIC MATERIALS
M. R. Brown and W. A. Shand Apr. 1970 22 p refs
(SRDE-70009; BR19349) Avail: NTIS HC $3.25

The application of X-ray stimulated luminescence to the detection of trivalent rare earth impurities in ionic materials is discussed. Also considered are the advantages offered by the use of an X-ray source as pumping source in optical spectroscopy. Author

N72-24482# Physics Lab. RVO-TNO, The Hague (Netherlands). Physics Lab.
TIME OF FLIGHT MEASURING EQUIPMENT
A. W. M. vanderVoort Oct. 1971 108 p In DUTCH; ENGLISH summary
(PHL-1971-46; TDCK-059298) Avail: NTIS HC $7.50

Two independent measuring-systems were designed to measure the time of flight of projectiles provided with a time-fuse. The time of flight is indicated by means of two electronic counters: one for each measuring system. The start and stop pulses for the counters are derived from signals coming from different input systems of the equipment. The systems for the start-pulse are: (1) an acoustic circuit-breaker or (2) an infrared detector. The detonation of the projectile is attended by a light-flash and an electromagnetic signal. An infrared detector converts the light-flash and a receiver converts the electromagnetic signal into electronic signals, that are transformed into stop pulses for the electronic counters. The counters are independently stopped by two detectors. Author

N72-24483# Physics Lab. RVO-TNO, The Hague (Netherlands).
A DETECTION SYSTEM WITH TWO PHOTOMULTIPLIER UNITS FOR BALLISTIC VELOCITY MEASUREMENTS
A. W. M. vanderVoort Nov. 1971 69 p In DUTCH; ENGLISH summary
(PHL-1971-51; TDCK-59563) Avail: NTIS HC $5.50

The apparatus, described in this report, is a part of the system for the velocity-measurements of projectiles. The equipment consists of two optical detection systems and a processor. The optical systems have a fan-shaped field of view, that is placed perpendicularly on the trajectory of the projectile. When a projectile passes through the field of view of one of the optical systems, the skylight falling on a photomultiplier decreases. The photomultiplier transforms the light-decrease into an electrical signal, which is transformed into pulses, corresponding in time with the passing of the front or the back of the projectile through the field of view. When the optical systems are positioned apart at a certain distance, it is possible to measure the time interval between the front and the time interval between the back of the two photomultiplier signals with two electronic counters. Author

N72-24484# Physics Lab. RVO-TNO, The Hague (Netherlands). Physics Lab.
AN ELECTRONIC TIME-INTERVAL MEASURING APPARATUS
A. W. M. vanderVoort Apr. 1971 42 p In DUTCH; ENGLISH summary
(PHL-1971-17; TDCK-58616) Avail: NTIS HC $4.25

The unit of time is adjustable at 0.1, 1, 10 or 100 microseconds. The results of the measurement is indicated by nixy tubes and is represented in the form of a decimal number (in-line display). The counter contains seven decades, so the maximum time-interval that can be measured is 1, 10, 100, seconds. It is possible to reset a number of counters simultaneously. The counter is also provided with a binary-decimal coded output. Author

N72-24485# National Defence Research Organization TNO, Soesterberg (Netherlands).
THE VECTOR VOLTMETER AS A TOOL TO MEASURE ERG SPECTRAL
Pieter Padmos and Dirk vanNorren 1972 13 p refs Submitted for publication
(IZF-1972-4; TDCK-59531) Avail: NTIS HC $3.00

An apparatus is described which gives both phase and amplitude of the electroretinographic response to a flickering stimulus as a numerical output. This makes the apparatus useful in determining spectral sensitivity functions and dark adaptation curves of man and animals, in particular since it enables automatic measurement of these functions. The limitations and applications are briefly discussed. Author

N72-24486# National Defense Research Organization TNO, The Hague (Netherlands). Physics Lab.
THE CALIBRATION OF THE SENSITIVITY OF SEVERAL PHOTODETECTORS AS A FUNCTION OF THE WAVELENGTH
J. G. W. vanKampen Jan. 1971 42 p In DUTCH; ENGLISH

summary
(PHL-1971-3; TDCK-58290) Avail: NTIS HC $4.25

The calibration of sensitivity as a function of the wavelength of photomultipliers and the vacuum photodiode in the 0.6 - 1.2 micron range is described. Measurements of the peak power of the radiation emitted by a neodymium pulse laser are made at the same time with two of the calibrated photodetectors.
Author

N72-24487# National Defense Research Organization TNO, The Hague (Netherlands).
A GAS-PRESSURE MEASURING DEVICE FOR THE ROYAL NETHERLANDS NAVY
S. Kukler Oct. 1971 52 p In DUTCH; ENGLISH summary
(PHL-1971-43; TDCK-59360) Avail: NTIS HC $4.75

A gas pressure measuring device is described that is partly composed of units from the Kistler firm. The maximum value and the integral of the gas pressure which occur while a gun is fired can be measured with this device and at the same time the curve of the gas pressure and the curve of the differential of the gas pressure can be displayed on an oscilloscope.
Author

N72-24488*# Massachusetts Inst. of Tech., Cambridge. Charles Stark Draper Lab.
PRELIMINARY SOFTWARE DEVELOPMENT FOR OPTICAL MIRROR FIGURE CONTROL Technical Report, May - Dec. 1970
Duncan MacKinnon Dec. 1970 114 p refs
(Contract NAS5-21542; DSR Proj. 55-34900)
(NASA-CR-122400; R-685) Avail: NTIS HC $7.75 CSCL 14B

The maintenance of accurate primary mirror figure in the face of environmental disturbances is the key to the achievement of diffraction-limited performance in a large space telescope. In order to develop the concepts of optical mirror figure control, an experimental program was initiated. A major component in this experiment will be an XDS Sigma 5.7 digital computer which will realize the control algorithm. A software package is described which realizes linear optimal, simplified linear, and iterative optimal control algorithms. The software, in addition, provides for interactive communication between the operator and the computer, and interaction between the computer and the experimental hardware elements. A brief description of a small hybrid computer system is also presented.
Author

N72-24489# Joint Publications Research Service, Arlington, Va.
INVESTIGATIONS OF GYROSCOPE MOTIONS
9 May 1972 14 p refs Transl. into ENGLISH from Priborostroyeniye (Leningrad), v. 15, no. 2, 1972
(JPRS-55935) Avail: NTIS HC $3.00

A study of the mercury cushion effect on the accuracy of a gyroscope during random rolling is presented along with an investigation for constructing a free gyroscope on a uniformly rotating base. For individual titles, see N72-24490 through N72-24491.

N72-24490# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF THE MERCURY CUSHION IN THE COMBINED HYDROSTATIC SUPPORT OF GYROCOMPASS ACCURACY UNDER IRREGULAR ROLLING CONDITIONS
D. P. Muzlov and Yu. A. Taran *In its* Invest. of Gyroscope Motions 9 May 1972 p 1-5 refs (See N72-24489 15-14)
Avail: NTIS HC $3.00

The effect of the gyrocompass mercury cushion on the accuracy of its indications during random rolling of the base is examined for the Amur type. It is shown that incomplete mutual correlation of the mercury cushion perturbations during rolling causes the appearance of a supplementary compass error.
Author

N72-24491# Joint Publications Research Service, Arlington, Va.
HOVE'S GYROSCOPE ON A UNIFORMLY ROTATING BASE
S. S. Arutyunov and G. N. Dmitriyev *In its* Invest. of Gyroscope Motions 9 May 1972 p 6-12 refs (See N72-24489 15-14)
Avail: NTIS HC $3.00

The possibility of constructing a free gyroscope on a base according to Hove's scheme is analyzed. Based on the assumption that the gyroscope is placed on a base rotating with constant velocity around its axis, perpendicular to the axis, the position of the gyroscope angular position is determined with respect to the base. It is concluded that the complete elimination of forced movement in Hove's gyroscope does not appear possible.
F.O.S.

N72-24492*# Radio Corp. of America, Harrison, N.J. Thermoelectric Products Engineering Dept.
HYBRID THERMOCOUPLE DEVELOPMENT PROGRAM Final Report
L. P. Garvey, T. R. Krebs, and E. Lee Oct. 1971 103 p
(Contract NAS3-11843)
(NASA-CR-120875) Avail: NTIS HC $7.25 CSCL 14B

The design and development of a hybrid thermocouple, having a segmented SiGe-PbTe n-leg encapsulated within a hollow cylindrical p-SiGe leg, is described. Hybrid couple efficiency is calculated to be 10% to 15% better than that of an all-SiGe couple. A preliminary design of a planar RTG, employing hybrid couples and a water heat pipe radiator, is described as an example of a possible system application. Hybrid couples, fabricated initially, were characterized by higher than predicted resistance and, in some cases, bond separations. Couples made later in the program, using improved fabrication techniques, exhibited normal resistances, both as-fabricated and after 700 hours of testing. Two flat-plate sections of the reference design thermoelectric converter were fabricated and delivered to NASA Lewis for testing and evaluation.
Author

N72-24493# National Oceanographic Instrumentation Center, Washington, D.C.
MODEL RS6 CONDUCTIVITY TEMPERATURE AND DEPTH INDICATOR, BECKMAN INSTRUMENTS, INC., CEDAR GROVE, NEW JERSEY 07009
Apr. 1972 11 p
(IFS-72005) Avail: NTIS HC $3.00

Manufacturer's performance results for a conductivity-temperature-depth indicator are presented in tabular form. The device is designed for use in shallow coastal waters, bays, and estuaries where large salinity and temperature changes occur. Conductivity was sensed over the range of 0 to 60 mmho/cm by an inductively coupled toroidal coil; temperature was sensed from 0 to 30 C with a thermistor; and depth was sensed from 0 to 60 ft with a bellows driven potentiometer. Instrument errors are graphed.
E.H.W.

N72-24494*# Perkin-Elmer Corp., Wilton, Conn. Electro-Optical Div.
THREE-METER TELESCOPE STUDY Final Report, 29 Jun. 1970 - 31 May 1971
A. Wissinger, R. M. Scott, W. Peters, W. Augustyn, Jr., R. Arnold, A. Offner, M. Damast, B. Boyce, R. Kinnaird, and J. Mangus (Goddard Space Flight Center) Aug. 1971 199 p refs
(Contract NAS5-21540)
(NASA-CR-122399; ER-10713) Avail: NTIS HC $12.00 CSCL 20F

A means is presented whereby the effect of various changes in the most important parameters of a three meter aperature space astronomy telescope can be evaluated to determine design trends and to optimize the optical design configuration. Methods are defined for evaluating the theoretical optical performance of axisymmetric, centrally obscured telescopes based upon the intended astronomy research usage. A series of design parameter variations is presented to determine the optimum telescope configuration. The design optimum requires very fast primary mirrors, so the study also examines the current state of the art in fabricating large, fast primary mirrors. The conclusion is that a 3-meter primary mirror having a focal ratio as low as f/2 is feasible using currently established techniques.
Author

N72-24495*# Massachusetts Inst. of Tech., Cambridge. Charles Stark Draper Lab.
DESIGN OF OPTICAL MIRROR STRUCTURES Final Report, May 1969 - Nov. 1970
Keto Soosaar Jan. 1971 148 p refs
(Contract NAS5-21542)
(NASA-CR-122397; R-673) Avail: NTIS HC $9.50 CSCL 20F

The structural requirements for large optical telescope mirrors was studied with a particular emphasis placed on the three-meter Large Space Telescope primary mirror. Analysis approaches through finite element methods were evaluated with the testing and verification of a number of element types suitable for particular mirror loadings and configurations. The environmental conditions that a mirror will experience were defined and a candidate list of suitable mirror materials with their properties compiled. The relation of the mirror mechanical behavior to the optical performance is discussed and a number of suitable design criteria are proposed and implemented. A general outline of a systematic method to obtain the best structure for the three-meter diffraction-limited system is outlined. Finite element programs, using the STRUDL 2 analysis system, were written for specific mirror structures encompassing all types of active and passive mirror designs. Parametric studies on support locations, effects of shear deformation, diameter to thickness ratios, lightweight and sandwich mirror configurations, and thin shell active mirror needs were performed. Author

N72-24496# Tokyo Univ. (Japan). Inst. of Space and Aeronautical Science.
SATELLITE-BORNE dE/dx-E SEMICONDUCTOR DETECTOR TELESCOPE FOR ISOTOPE IDENTIFICATION IN HEAVY PRIMARY COSMIC RAY PARTICLES OF MASS NUMBER M EQUAL TO OR GREATER THAN 7 AND EQUAL TO OR LESS THAN 56
Tadayoshi Doke and Katsuaki Nagata (Tamagawa Univ.) Dec. 1971 14 p refs
(ISAS-474-Vol-36-No-16) Avail: NTIS HC $3.00

Satellite-borne dE/dx-E semiconductor detector telescopes are proposed for isotope identification in heavy primary cosmic ray particles of mass number 7 < or equal z < or equal 56. Some disadvantages in the use of a scintillation counter as an E-detector are pointed out. Next, mass resolutions in dE/dx-E detector telescopes consisting of only semiconductor (silicon) detectors are estimated for dE/dx-detectors of various thickness. As a result, it is shown that separation of the two adjacent isotopes near iron nucleus can be achieved by the detector telescopes. The dE/dx-E detector telescopes, of which E-detector is composed of three transmission type silicon detectors of 5 mm in thick stacked in series, are designed for carbon and manganese isotope identification in the energy region near 100 Mev/nucleon. Author

N72-24497# Lockheed Missiles and Space Co., Palo Alto, Calif.
MEASUREMENT OF THE NEUTRAL ATMOSPHERIC TEMPERATURE BY USING A RIM-901 DEVICE ON THE KOSMOS-320
N. V. Dzhordzhio, E. M. Nikolaenko, L. G. Oldekop, and E. E. Khavin 1972 7 p refs Transl. into ENGLISH from Geomagnetism i Aeronomiya (Moscow), v. 12, no. 1, 1971 p 77-82
Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

A RIM-901 manometer, intended to measure the temperature of the neutral atmosphere, is described. The device is mounted in the nose section of the Cosmos-320 satellite. Results of the temperature measurement are given. The fluctuations in the neutral temperature similar to those observed earlier in the ion temperature fluctuations are detected in the evening hours near the equator. Author

N72-24498# National Defense Research Organization TNO, Rijswijk (Netherlands).
AN APPARATUS FOR THE AUTOMATED RECORDING OF INFRARED SPECTRA OF GASEOUS SAMPLES FROM LIQUID OXYGEN
F. H. Meppelder Jul. 1971 24 p ref
(CL-1971-16; TDCK-58312) Avail: NTIS HC $3.25

An electromechanical device is described which automatically performs the manipulations necessary for recording the infrared spectra of a series of gaseous oxygen samples. A spectrum of each sample at 10 atm, or any other adjustable lower value and a spectrum at 1 atm, are recorded. The reliability of the apparatus is such that a series of 10 samples can be handled unattended. The automate was developed for the analysis of trace contaminants in aviator's breathing oxygen; some other fields of application are indicated. Author

N72-24499# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
X-RAY BEAM NONUNIFORMITY EFFECTS ON DOSIMETERS CALIBRATION USING THE FREE AIR IONIZATION CHAMBER
L. Pugliani and P. Salvadori 15 Sep. 1971 40 p refs In ITALIAN; ENGLISH summary
(ISS-71/24) Avail: NTIS HC $4.00

The nonuniformity of the incident X-ray beam is considered for proper calibration of dosimeters using the free air ionization chamber. Some measurements are presented that lead to a satisfactory solution of the problem. Author

N72-24500# Istituto Superiore di Sanita, Rome (Italy).
MAGNETIC RESONANCE SPECTROSCOPY IN BIOLOGICAL SYSTEMS
E. Tiezzi 8 Nov. 1971 38 p refs In ITALIAN; ENGLISH summary
(ISS-71/30) Avail: NTIS HC $4.00

These notes give a general view of the various methods of magnetic resonance spectroscopy and of their possible applications to biological and medical problems. After analyzing the fundamental NMR and EPR techniques, double resonance (ENDOR), pulsed NMR and NMR techniques are described. The subject is explained in such a manner as to be easily understood also by non-specialists. Author

N72-24501# Istituto Superiore di Sanita, Rome (Italy).
AN EXPERIMENTAL APPARATUS FOR THE DETECTION OF PHOTOCONDUCTIVE PROPERTIES IN SEMICONDUCTORS
D. Gili-Tos, M. Grandolfo, and G. Mariutti 4 Oct. 1971 15 p refs In ITALIAN; ENGLISH summary
(ISS-71/28) Avail: NTIS HC $3.00

An experimental apparatus for the detection of the photoconductive properties of semiconductors is shown. The system is based on the modulation of the incoming radiation and a successive phase sensitive detection of the photoconductive signal. Preliminary results obtained on a sample of GaS are presented. Author

N72-24502# Gulf General Atomic, San Diego, Calif.
RELIABILITY ANALYSIS OF HIGH TEMPERATURE THERMOCOUPLES IN IRRADIATION CAPSULES
F. K. Jacobsen, N. L. Sandefur, and R. J. Grenda 27 Oct. 1971 23 p
(Contract AT(04-3)-633)
(GULF-GA-A-10864) Avail: NTIS

In conjunction with nuclear fuels development testing being conducted by Gulf General Atomic, data were recorded for 571 thermocouples used to monitor temperatures of the test capsules. Analysis of the data indicates that thermocouple reliability is primarily a function of: (1) the material used to make the thermocouple, (2) the temperature at which the thermocouple operates, (3) the intensity of the neutron flux field to which the thermocouple is exposed. There is no indication that an endurance limit is being approached in testing durations up to 6000 hours and 6 x 10 to the 21st power fast neutrons per square

centimeter (E > 0.18 MeV). Average values of mean time between failures are tabulated. Author (NSA)

N72-24503# Oak Ridge National Lab., Tenn.
SETUP AND CONTROL ROUTINES FOR A PULSED NEUTRON TIME OF FLIGHT SPECTROMETER
L. W. Gilley 4 Feb. 1972 31 p refs
(Contract W-7405-eng-26)
(ORNL-TM-3683) Avail: NTIS

The programming required for setup and control of an experiment on a magnetically pulsed neutron time-of-flight spectrometer installed at the HFIR is described. After a general description of the hardware and software, some of the routines are discussed in greater detail and some examples of experimental setup are given. NSA

N72-24504# California Univ., Livermore. Lawrence Livermore Lab.
DYNAMIC EFFECTS OF A PRESSURE TRANSDUCER DUE TO RECESSING
William M. Shay 8 Dec. 1971 20 p refs
(Contract W-7405-eng-48)
(UCRL-51156) Avail: NTIS

Many times pressure measurements are made where the sensitive part of the transducer, the diaphragm, is away or recessed from the pressure source. Recessing creates no problem for static conditions but it does for dynamic conditions. The data obtained from a recessed transducer can be anywhere from valid to invalid. To explore the effect of recessing, a shock tube was used to produce a pressure step with a very short rise time. Shock tubes give pressure step amplitudes from a few psi to several hundred psi, with a rise time as short as 10 to the minus 9th power sec. Author

N72-24505# Los Alamos Scientific Lab., N.Mex.
CONCEPTS OF RADIOGRAPHIC IMAGE ENHANCEMENT
D. H. Janney, B. R. Hunt, and R. K. Zeigler [1971] 22 p Presented at Spring Conf. of the Am. Soc. for Nondestructive Testing, Los Angeles, 13 Mar. 1972 Sponsored by AEC
(LA-DC-72-57; Conf-720301-3) Avail: NTIS

Mathematical concepts of image convolution, Fourier transformation, and spatial frequency filtering which are alien to the training and experience of the practicing industrial radiographer are discussed. The motivation for application of these techniques to industrial radiography is examined and the basic mathematical concepts are discussed by means of qualitative and plausibility arguments. Recourse is made, for pedagogical purposes, to analogies from electrical technology. The types of hardware required and the computer needs for image enhancement by the methods discussed are described. Advantages and disadvantages of various image handling systems are enumerated. Author

N72-24506# Compagnie Francaise Thomson Houston-Hotchkiss Brandt, Paris. Lab. Central de Recherches.
STUDY OF HOLOGRAPHIC LENSES AND IMPROVEMENT OF THEIR PERFORMANCE AND STIGMATISM [ETUDE ET AMELIORATIONS DU RENDEMENT ET DU STIGMATISME DES LENTILLES HOLOGRAPHIQUES]
J. P. Huignard 13 Jan. 1970 64 p refs In FRENCH
(Contract SPERAC-980-9059-401-5-299)
(LCR-DR-1-70-8/1/R) Avail: NTIS HC $5.25

The parameters to consider in improving holographic lenses are discussed. It is shown that efficiency, geometric and chromatic aberration play a leading role. Experimental optimization of recording processes leads to a rise of the efficiency factor from 3.5 to 20 percent by prewhitening of the silver substrate. The contrast in the image is only 3 percent for a period in the object of 10 microns. Chromatic aberration is the most important for the central lens, the mean diameter of chromatic scattering area being 800 microns against 200 microns for the diffraction area. It is suggested that the efficiency could be improved by using other photosensible supports such as bichromate gelatines. Author (ESRO)

N72-24507# Institut d'Astrophysique, Liege (Belgium).
DESCRIPTION OF A TELESCOPE-SPECTROGRAPH COMBINATION FOR RECORDING STELLAR SPECTRA IN THE FAR UV ONBOARD STABILIZED SKYLARK SOUNDING ROCKETS [DESCRIPTION D'UNE COMBINAISON TELESCOPE-SPECTROGRAPHE DESTINEE A L'ENREGISTREMENT DE SPECTRES STELLAIRES DANS L'UV LOINTAIN AU MOYEN DE FUSEES SKYLARK STABILISEES]
J.-M. Vreux and G. Marette Paris ESRO Jun. 1971 27 p refs In FRENCH; ENGLISH summary
(ESRO-SM-79) Avail: NTIS HC $3.50

A modification of the equipment developed for the ESRO Skylark sounding rocket experiment R-146 to obtain photographic recordings of stellar spectra in the far ultraviolet is reported. The optics of a prototype, which is a modified version of the auroral spectrograph in association with a Cassegrain telescope, are considered. The fundamental principles are reviewed, the flight model is described, and its transmission coefficient estimated. Author (ESRO)

N72-24508# Institut Franco-Allemand de Recherches, St. Louis (France).
FEASIBILITY STUDY OF FABRY-PEROT INTERFEROMETRY FOR VISUALIZATION OF RAPID PHASE OBJECTS OF VERY WEAK INTENSITY [ETUDE DES POSSIBILITES DE L'INTERFEROMETRIE A ONDES MULTIPLES EN VUE DE LA VISULALISATION DES OBJETS DE PHASE RAPIDES DE TRES FAILBLE INTENSITE]
A. Hirth 7 Dec. 1970 35 p refs In FRENCH
(Contract T/0260/02630/01095)
(ISL-28/70) Avail: NTIS HC $3.75

The use of a Fabry-Perot interferometer in combination with a Q-switched ruby laser to visualize rapidly changing phase objects of weak intensity was investigated. The regulation of a Fabry-Perot interferometer for unlimited flat response is difficult when the light source is a Q-switched ruby laser due to the variation in laser frequency within the impulse. A frequency drixt of 1.7 MHz/ns was found. By placing the phase object in the laser cavity resonator, automatic tuning was obtained between the laser emitted frequency and the Fabry-Perot resonator frequency. The improvement in sensitivity of this multiple wave interferometry as compared to the two-wave interferometer, is calculated. Author (ESRO)

N72-24509# National Physical Lab., Teddington (England). Div. of Quantum Metrology.
CORRECTION FOR TEMPERATURE OF COIL FORMERS OF NPL CURRENT BALANCE
P. Vigoureux and N. Dupuy Mar. 1972 13 p refs
(NPL-QU-23) Avail: NTIS HC $3.00

The temperature rise of the marble coil formers in a current balance was compared with the temperature rise deduced from the change of the electric resistance of the windings. It was found that the temperature rise of the cylinders can be estimated from resistance measurements to 0.1 K, and that the associated uncertainty of a measurement of the ampere is less than 0.4 ppm. Considerations based on the thermal conductivity and the thermal coefficient of expansion of fused silica suggest that the corresponding uncertainty with cylinders of fused silica should be under 0.1 ppm. Author (ESRO)

N72-24510# Rome Univ. (Italy). Inst. of Physics.
EXPERIMENTAL AND THEORETICAL OUTLINES OF A NEW INTERFEROMETRIC TECHNIQUE TO REJECT THE CENTRAL LINE IN RAMAN SPECTROSCOPY
V Mazzacurati 11 Feb. 1972 25 p refs
(Nota-Interna-359) Avail: NTIS HC $3.25

Many experiments in Raman spectroscopy are limited by background due to the elastic scattering line (Tyndall effect) or spurious reflection of the light beam in the sample which is not completely rejected by the usual grating spectrometer. The reduction of this stray light background is improved by the use

of dual chromatons with high contrast factors. A system using a Fabry-Perot interferometer in addition to the classical monochromatron and permitting the elimination of a given frequency is analyzed theoretically and its possible use for rejection of the central line in Raman spectroscopy is outlined.
Author (ESRO)

N72-24511# Kansas Univ., Lawrence. Center for Research.
TEXTURE-TONE STUDY WITH APPLICATION TO DIGITIZED IMAGERY Interim Technical Report, 1 Nov. 1970 - 1 Nov. 1971
Robert M. Haralick and Delmar E. Anderson Nov. 1971 154 p refs
(Contract DAAK02-70-C-0388; DA Proj. 4A0-62112-A-854)
(AD-737722; CRES-TR-182-2; ETL-CR-71-14) Avail: NTIS CSCL 14/5

An image data set of 54 scenes was obtained from 1/8 inch by 1/8 inch areas on a set of 1:20000 scale photography. The scenes, which consisted of 6 samples from each of the nine categories scrub, orchard, heavily wooded, urban, suburban, lake, swamp, marsh, and railroad yard, were analyzed manually and automatically. For the automatic analysis, a set of features measuring the spatial dependence of the grey tones of neighboring resolution cells was defined. On the basis of these features and a simple decision rule, which assumed that the features were independent and uniformly distributed, an identification accuracy of 70% was achieved by training on 53 samples and assigning an identification to the 54th sample and repeating the experiment 54 times.
Author (GRA)

N72-24512# Army Electronics Command, Fort Monmouth, N.J.
NEWTONIAN LIMIT FOR VISCOSITY MEASUREMENTS KMER PHOTORESIST SOLUTIONS Research and Development Technical Report
D. W. Yarbrough, Edward A. Shires, and Herbert L. Mette Jan. 1972 13 p
(DA Proj. 1S6-62705-A-440)
(AD-737596; ECOM-3526) Avail: NTIS CSCL 14/5

Rapid measurements of the viscosity of photoresist solutions, that are being performed as part of process control in integrated circuit technology, are usually based on methods, such as the Ostwald-Cannon-Fenske viscometer, which apply only to Newtonian liquids. The present investigation was, therefore, designed to determine the range of dilutions for Kodak Metal-Etch Resist for which the solution becomes non-Newtonian. The results presented indicate that non-Newtonian behavior occurs only at mixtures with thinner concentrations above 10 percent, and that for most photoresist applications, non-Newtonian behavior need not be considered.
Author (GRA)

N72-24513# Kansas Univ., Lawrence. Dept. of Physics and Astronomy.
ELECTRON SPECTROSCOPY WITH SILICON SURFACE BARRIER DETECTORS AT LIQUID HELIUM TEMPERATURES Technical Report, 1 Jul. - 31 Dec. 1971
Kevin P. Barr, Richard C. Sapp, and John T. Tarvin 1 Feb. 1972 22 p
(Contract Nonr-2775(00))
(AD-737625; TR-72-1) Avail: NTIS CSCL 18/4

In connection with the development of apparatus for the study of beta-radiations with energies of up to 500 keV from nuclei oriented at dilution refrigerator temperatures, four commercial silicon surface barrier detectors were tested for resolution as a function of temperature and applied bias. Resolutions of 8 keV (FWHM) at liquid helium temperatues were obyained at only 20 V bias. Problems with reliability and breakup of the aluminum back surface, as well as subsequent rzpair, are discussed, and comparisons are made to other work using cooled semiconductor detectors for beta-spectroscopy.
Author (GRA)

N72-24514# IBM Watson Research Center, Yorktown Heights, N.Y.
ELECTRON BEAM FABRICATION OF HIGH FREQUENCY, LOW LOSS, WIDE BAND-WIDTH INTERDIGITAL ACOUSTIC SURFACE WAVE TRANSDUCERS Interim Report
Alec N. Broers and Michael Hatzakis 16 Feb. 1971 43 p refs
(Contract F19628-70-C-0018; AF Proj. 5635)
(AD-738184; AFCRL-71-0323; SR-1) Avail: NTIS CSCL 14/2

Electron beam fabrication techniques for the building of surface acoustic wave transducers are described. The report contains descriptions of the electron beam equipment used for writing the desired patterns and also the resist and thin film techniques used to produce the metal structures. A list of devices built to the time of the report is included. Author (GRA)

N72-24515# New Hampshire Univ., Durham. Dept. of Physics.
DEVELOPMENT AND USE OF SMALL TELLURIUM GAUGES FOR LABORATORY SCALE STUDIES OF UNDERWATER SHOCK WAVES Summary Report, 1946 - 1970
Harry H. Hall Jul. 1971 45 p refs
(Contract N60921-67-C-0075)
(AD-738196; Rept-71-1) Avail: NTIS CSCL 14/2

To realize the benefits of small scale laboratory studies of the propagation of underwater shock waves, gauges having high frequency response and high resolving power are required. This report describes the development and current fabrication of 1/16 inch diameter solid state (Tellurium) gauges for this purpose. Chemically Pure Tellurium was refined, and suitably doped with Antimony or Bismuth, to minimize the effect of temperature upon the pressure sensitivity of its electrical resistance. Small sintered pellets of this material with platinum electrodes, serve successfully as transducers for shock waves generated by number 6 electric blasting caps in a special nylon tank in the laboratory. The equipment records shock pressures ranging between 3 and 300 PSI, with time bases between 50 microseconds and 100 milliseconds or longer, and will resolve wave details as short as 2 microseconds duration. Calibration and reliability experience of the gauges is discussed, and the design of the tank and electronic equipment is described.
Author (GRA)

N72-24516# Army Edgewood Arsenal, Md.
GUIDE FOR SLIT-LAMP PHOTOGRAPHY OF THE CORNEA
Roy H. Rengstorff and Charles C. Krausse, Jr. Feb. 1972 19 p
(DA Proj. 1W5-62606-AD-22)
(AD-738110; EA-SP-1100-4) Avail: NTIS CSCL 14/5

A concise description of how to take good slit-lamp photographs of the cornea, both in black and white and in color, is given. The guide applies specifically to the Nikon slit lamp, but much of the information is applicable to all slit lamps with photographic attachments.
Author (GRA)

N72-24517# Army Engineer Topographic Labs., Fort Belvoir, Va.
MICROMAP CAMERA FOR DISPLAY SYSTEMS Engineer Design Test Report, Mar. 1967 - Jun. 1970
Erik K. Woods Oct. 1971 50 p
(DA Proj. 4A6-63712-D-855)
(AD-738163; ETL-ETR-71-5) Avail: NTIS CSCL 14/5

The report covers the engineer design tests of a precision copy camera designed for the production of high-precision film chips or continuous filmstrips ranging in size from 35 mm by 60 mm up to 9 by 9 inches. This report evaluates the resolution, distortion, parallelism, scale accuracy and other capabilities of the camera and system for use in the reduction of maps, charts, mosaics, or other flat color or black-and-white material up to a maximum size of 75 by 75 inches. The report concludes that: (a) the micromap camera for display systems meets all the requirements of the purchase description and is suitable for the reduction of topographic data in the various formats as stated herein; (b) the micromap camera for display systems utilizes standard photographic films and processes acceptable for Army

base plant use; (c) the camera represents a major advancement in the state of the art in microminiaturization. Author (GRA)

N72-24518# Naval Research Lab., Washington, D.C.
PROBLEM HO1-32 AIRBORNE RADIAC Progress Report, 1 Jan. - 30 Jun. 1971
C. W. Peters and D. C. Cook Jan. 1972 16 p refs
(NRL Proj. HO1-32)
(AD-737993; NRL-MR-2391) Avail: NTIS CSCL 18/4

The report summarizes the results of the computer calculations of the response of the detector of the Airborne Radiac. The calculations were made as a function of altitude from 2,000 to 8,000 feet and for barometric pressures from 50 to 76 cm of Hg. Analytical equations for converting the detector response to dose rate at ground level are presented. The final status of the Airborne Radiac is reviewed. A Flyable Breadboard is complete and ready for flight testing. Other models are partially completed and are available as spare equipment or for measurements that may be required for future advanced development. Author (GRA)

N72-24519# Army Foreign Science and Technology Center, Charlottesville, Va.
INTERFERENCE FOURIER SPECTROSCOPY WITH HIGH RESOLVING POWER
S. M. Gorskii, V. A. Zverev, and G. K. Ivanova 1 Feb. 1972 8 p refs Transl. into ENGLISH from Zh. Prikl. Spektroskopii, Akad. Nauk Belorussk. SSR (Minsk), v. 11, no. 2, Aug. 1969 p 355-357
(AD-737959; FSTC-HT-23-382-72) Avail: NTIS CSCL 14/2

A brief description is presented of an improved method of Fourier spectroscopy, resulting in elimination of some of the limitations inherent in earlier Fourier spectroscopy methods. Author (GRA)

N72-24520# Stanislaus State Coll., Turlock, Calif. Gravity Research.
CRYOGENIC GRAVITY METER Final Report, Apr. 1968 - Jul. 1971
Vladimir S. Tuman and Ahmd Waleb Aug. 1971 70 p refs
(Contract F19628-68-C-0218; AF Proj. 8607)
(AD-737834; AFCRL-71-0472) Avail: NTIS CSCL 14/2

The report describes a cryogenic gravity meter which has a theoretical sensitivity of about 25 millimicrogal. The instrument consists of two parts--a suspension unit and a detection module. There are nine other units of power supplies, amplifiers, and other circuits as accessories for the operation of the instrument. The suspension unit is a cylindrically symmetric superconducting magnet with a large magnetic field and a small magnetic field gradient at the center of the instrument. The detection module is a double Josephson's junction magnetometer, also known as SQUID, which detects the magnetic flux change due to the motion of the hollow sphere. Author (GRA)

N72-24221# Israel Program for Scientific Translations, Ltd., Jerusalem.
INFRARED MICROSCOPE FOR MONITORING LOCAL TEMPERATURES IN THIN FILM MICROCIRCUITS
V. A. Abradzhioni, Yu. A. Nevskii, and V. I. Kokoulin *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 32-36 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

N72-24224# Israel Program for Scientific Translations, Ltd., Jerusalem.
DYNAMIC MASS ANALYZERS, A REVIEW
A. E. Rafalson and L. N. Ozerov *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 49-69 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

N72-24225# Israel Program for Scientific Translations, Ltd., Jerusalem.
APPLICATION OF A RADIO FREQUENCY MASS SPECTROMETER FOR MONITORING VACUUM DEPOSITION OF MAGNETIC FILMS
V. A. Kaplin and B. P. Malykh *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 70-75 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

N72-24226# Israel Program for Scientific Translations, Ltd., Jerusalem.
A GENERATOR OF WOBBLE FREQUENCY FOR RADIO FREQUENCY MASS SPECTROMETERS
V. A. Kaplin and A. S. Nudelman *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 76-81 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

N72-24227# Israel Program for Scientific Translations, Ltd., Jerusalem.
MASS SPECTROMETRIC MONITORING OF GAS DYNAMICS IN EVAPORATION OF TITANIUM, ALUMINUM AND SILICON MONOXIDE
V. A. Kaplin, V. V. Konyashkin, and B. S. Potapov *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 82-85 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

N72-24267# Israel Program for Scientific Translations, Ltd., Jerusalem.
AUTOMATIC RANGE SELECTOR FOR THE F116 INSTRUMENT
N. S. Kormilitsyn *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 129-132 (See N72-24251 15-08)
Avail: NTIS HC $17.00

N72-24269# Israel Program for Scientific Translations, Ltd., Jerusalem.
UNIT FOR WIDE RANGE MEASUREMENT OF ELECTRICAL SIGNALS IN DIGITAL FORM
V. G. Abramov, I. S. Lisker, and G. D. Roshchin *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 1971 p 140-145 refs (See N72-24251 15-08)
Avail: NTIS HC $17.00

N72-24124# Joint Publications Research Service, Arlington, Va.
SOME ELECTRIC PROPERTIES OF A TURBOMAGNETIC VELOCITY SENSOR
B. G. Kaduk, N. A. Verevka, and G. M. Tatarenko *In its* Bionics 15 May 1972 p 193-198 refs (See N72-24117 15-05)
Avail: NTIS HC $12.75

N72-24125# Joint Publications Research Service, Arlington, Va.
USE OF AN ELECTROLYTIC MICRO-CURRENT METER FOR MEASURING THE VELOCITY OF MOVEMENT
B. M. Yegidis and V. M. Shakalo *In its* Bionics 15 May 1972 p 199-204 refs (See N72-24117 15-05)
Avail: NTIS HC $12.75

15 MACHINE ELEMENTS AND PROCESSES

Includes bearings, seals, pumps, and other mechanical equipment; lubrication; friction, and wear; manufacturing processes and quality control, and reliability; drafting; and materials fabrication, handling, and inspection.

N72-24521 Japan Broadcasting Corp., Tokyo. Recording Techniques and Memory Devices Research Group.
PLATED MAGNETIC DISC USING PLASTIC BASE
Eiji Torii and Koichi Ito Dec. 1971 8 p ref
(NHK-Labs-Note-148) Copyright. Avail: Issuing Activity

The selection of the base plate, the surface processing method, the prototype production of discs, and the video recording and playback tests undertaken are described. Author

N72-24522* Roph Corp., Chula Vista, Calif.
METHOD OF FORMING SHAPES FROM PLANAR SHEETS OF THERMOSETTING MATERIALS Patent
James A. Scholl, inventor (to NASA) Issued 25 Apr. 1972 5 p Filed 28 May 1970 Sponsored by NASA
(NASA-Case-NPO-11036; US-Patent-3,658,974; US-Patent-Appl-SN-41346; US-Patent-Class-264-92) Avail: US Patent Office CSCL 13H

A method for forming shapes from planar sheets of thermosetting honeycomb core is described that is particularly suited for use in forming the center sections of aeroshells. It is characterized by steps of heat shocking thermosetting honeycomb core stock, deformation of the sheet about a male forming tool having a surface of a predetermined configuration, and by curing the thus deformed shell while subjecting it to a holding vacuum applied through the curved supporting surface of a female forming tool. Official Gazette of the U.S. Patent Office

N72-24523*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Project Engineering Div.
COLD-WELDING TEST ENVIRONMENT
John T. Wang 1 Feb. 1972 17 p refs
(Contract NAS7-100)
(NASA-CR-125603; JPL-TR-32-1547) Avail: NTIS HC $3.00 CSCL 13H

A flight test was conducted and compared with ground test data. Sixteen typical spacecraft material couples were mounted on an experimental research satellite in which a motor intermittently drove the spherical moving specimens across the faces of the fixed flat specimens in an oscillating motion. Friction coefficients were measured over a period of 14-month orbital time. Surface-to-surface sliding was found to be the controlling factor of generating friction in a vacuum environment. Friction appears to be independent of passive vacuum exposure time. Prelaunch and postlaunch tests identical to the flight test were performed in an oil-diffusion-pumped ultrahigh vacuum chamber. Only 50% of the resultant data agreed with the flight data owing to pump oil contamination. Identical ground tests were run in an ultrahigh vacuum facility and a ion-pumped vacuum chamber. The agreement (90%) between data from these tests and flight data established the adequacy of these test environments and facilities. Author

N72-24524# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Munich (West Germany). Inst. fuer Flugtreib- und Schmierstoffe.
COATING OF TOOL STEEL ANTIFRICTION BEARINGS WITH MoS2 USING THE POLISHING PROCEDURE AND SOME TESTS IN ULTRAHIGH VACUUM AT APPROXIMATELY 10 NTORR
W. Hellwig and G. Spengler 7 Feb. 1972 29 p refs In GERMAN; ENGLISH summary
(DLR-FB-72-03) Avail: NTIS HC $3.50; DFVLR, Porz: 10, 30 DM

Using the polishing procedure, untreated and phosphatized as well as in situ -MoS2-treated ball races were coated with MoS2 or MoS2/PTFE to lubricate antifriction bearings with dry lubricants for runs in ultrahigh vacuum. Life and friction of these films were measured at different loads. It has been found that the double layer of MoS2/PTFE is particularly favourable in angular contact ball bearings. Phosphatized races resulted in an increased coefficient of friction. Test facilities and ultrahigh vacuum systems are described. Author

N72-24525# Bureau of Mines, Denver, Colo. Mining Research Center.
A THOUSAND TON CAPACITY STIFF TESTING MACHINE
F. G. Horino, B. T. Brady, W. I. Duvall, and V. E. Hooker 1972 22 p refs
(BM-RI-7624; LC-622.06173; TN23.U7) Avail: NTIS HC $3.25

The theory and design of a stiff loading machine are considered. The machine incorporates three high strength steel columns as restraining members in parallel with the specimen. The theory presented gives the basis of design and the dimensions of component parts of the machine. Laboratory verification of the theoretical stiffness is described using three different setups involving a hydraulic jack and spacers and confirms the stiffness calculations to within 1 percent. Experimental techniques, testing procedures, and special equipment designed for determining the complete stress-strain behavior of NX cores of both hard and soft rock are described. Typical test data are presented as force-displacement curves for two rock types, a marble and a granite. Author

N72-24526*# General Electric Co., Philadelphia, Pa.
NONDESTRUCTIVE TESTING OF SCOUT ROCKET MOTORS
Arthur E. Oaks Apr. 1972 284 p
(Contract NAS1-8994)
(NASA-CR-2013) Avail: NTIS HC $3.00 CSCL 14D

The nondestructive tests applied to Scout rocket motors were reviewed and appraised. Analytical techniques were developed to evaluate the capabilities of the radiographic and ultrasonic procedures used. Major problem areas found were the inadequacy of high voltage radiography for detecting unbonds and propellant cracks having narrow widths, the inability to relate the ultrasonic signals received from flat-bottomed holes in standards to those received from real defects and in the general area of the specification of acceptance criteria and how these were to be met. To counter the deficiencies noted, analyses were conducted to the potential utility of radiometric, acoustic, holographic and thermographic techniques for motor and nozzle bond inspection, a new approach to qualifying magnetic particle inspection and the application of acoustic emission analysis to the evaluation of proof and leak test data. Author

N72-24527*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HOW TO APPLY LIFE ADJUSTMENT FACTORS FOR BALL AND ROLLER BEARINGS
W. J. Crecelius, T. A. Harris, C. A. Moyer, R. J. Parker, J. J. Sherlock, and E. V. Zaretsky 1972 18 p refs Presented at Design Eng. Conf. and Show, Chicago, 8-11 May 1972; Sponsored by Am. Soc. of Mech. Engr.
(NASA-TM-X-68019; E-6824) Avail: NTIS HC $3.00 CSCL 13I

Practical problems applicable to the selection, design, and lubrication of rolling-element bearings are presented and discussed. Design and selection criteria are based upon materials and processing factors such as melting practice, metalworking, and heat treatment. Environmental factors are considered such as bearing misalignment and speed. Selection of a lubricant is based upon elastohydrodynamic lubrication principles in addition to lubricant type and chemistry. Author

N72-24528*# Teledyne Brown Engineering, Huntsville, Ala. Operations Analysis Section.
USER'S MANUAL FOR THE SIMULATED LIFE ANALYSIS OF VEHICLE ELEMENTS (SLAVE) MODEL Summary Report
D. D. Paul, Jr. Apr. 1972 70 p refs
(Contract NAS8-21804)
(NASA-CR-123542; ASD-ASTN-1519) Avail: NTIS HC $5.50 CSCL 14D

The simulated life analysis of vehicle elements model was designed to perform statistical simulation studies for any constant loss rate. The outputs of the model consist of the total number of stages required, stages successfully completing their lifetime, and average stage flight life. This report contains a complete description of the model. Users' instructions and interpretation of input and output data are presented such that a user with little or no prior programming knowledge can successfully implement the program. Author

N72-24529*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SPUTTERING: A VACUUM DEPOSITION METHOD FOR COATING MATERIAL
T. Spalvins 1972 18 p refs Presented at Design Eng. Conf., Chicago, 8-11 May 1972; sponsored by ASME
(NASA-TM-X-68058; E-6679) Avail: NTIS HC $3.00 CSCL 13H

The sputtering process is described in terms of its features: versatility, momentum transfer, configuration of target, precise controls and the relatively slow deposition rate. Sputtered films are evaluated in terms of adherence, coherence, and internal stresses. The strong adherence is attributed to the high kinetic energies of the sputtered material, sputter etched (cleaned) surface, and the submicroscopic particle size. An illustration is a sputtered solid film lubricant such as MoS2. Friction tests were conducted on a thin, 2000 A deg thick MoS2 film. These films are very dense and without observable pinholes, and the particle to particle cohesion is strong. Tolerances (film thickness) can be controlled to a millionth of a centimeter. Very adherent films of sputtered Teflon can be deposited in a single operation on any type of material (metal, glass, paper) and on any geometrical configuration with a dense adherent film. Author

N72-24530*# Boeing Co., Seattle, Wash.
APPLICATION OF POLYIMIDE ACTUATOR ROD SEALS
A. W. Watermann, B. F. Gay, E. D. Robinson, S. K. Srinath, and W. G. Nelson 30 Jan. 1972 177 p refs
(Contract NAS3-14317)
(NASA-CR-120878; D6-54351) Avail: NTIS HC $11.00 CSCL 11A

Development of polyimide two-stage hydraulic actuator rod seals for application in high-performance aircraft was accomplished. The significant portion of the effort was concentrated on optimization of the chevron and K-section second-stage seal geometries to satisfy the requirements for operation at 450 K (350 F) with dynamic pressure loads varying between 200 psig steady-state and 1500 psig impulse cycling. Particular significance was placed on reducing seal gland dimension by efficiently utilizing the fatigue allowables of polyimide materials. Other objectives included investigation of pressure balancing techniques for first-stage polyimide rod seals for 4000 psig 450 K(350 F) environment and fabrication of a modular retainer for the two-stage combination. Seals were fabricated in 0.0254 m (1.0in.) and 0.0635 m (2.5in.) sizes and tested for structural integrity, frictional resistance, and endurance life. Test results showed that carefully designed second stages using polyimides could be made to satisfy the dynamic return pressure requirements of applications in high-performance aircraft. High wear under full system pressure indicated that further research is necessary to obtain an acceptable first-stage design. The modular retainer was successfully tested and showed potential for new actuator applications. Author

N72-24531*# Scientific Translation Service, Santa Barbara, Calif.
DETERMINATION OF THE LIFETIME OF HELICOPTER COMPONENTS
R. Prinz Washington NASA May 1972 77 p refs Transl. into ENGLISH from Proc. of DGLR Symp. on Helicopters and Propellers, Immenstaat, West Germany, 24 Jun. 1969
(Contract NASw-2035)
(NASA-TT-F-14280) Avail: NTIS HC $6.00 CSCL 14D

Methods which are used, or are to be used in the future, for determining the lifetime of helicopter components are discussed. These methods are based on the determination of the working stress. Calculated or measured stress-time functions are studied, and both analytical and experimental methods are given for the statistical evaluation of these functions. The use of a unit collective for fatigue studies on rotor blades is also recommended, on the basis of various stress collectives reported in the bibliography. This unit collective can serve as the basis for fatigue studies. Some possibilities for carrying out fatigue studies are stated, and the necessity for statistical evaluation of test results is mentioned. Some methods for determining lifetime on the basis of the fluctuating stresses are presented. Author

N72-24532*# Perkin-Elmer Corp., Pomona, Calif. Aerospace Div.
ION PUMP AND LEAK LIFE TEST Final Report
N. Ierokomos Apr. 1972 41 p
(Contract NAS9-9799)
(NASA-CR-115638; SPO-30003) Avail: NTIS HC $4.25 CSCL 14D

The fabrication and long term testing of a flight type ion pump and sintered inlet leak are described. These tests were conducted over a period of one year at an ion pump pressure of approximately 0.000001 torr. These long term tests were conducted to investigate aging of ion pumps and leaks under continuous use. Pumping speed and leak conductance, as well as other parameters, were measured on a weekly basis with ion pump start tests conducted on a monthly basis. Author

N72-24533*# Hercules, Inc., Magna, Utah.
DEVELOPMENT OF LIGHTWEIGHT GRAPHITE/POLYIMIDE SANDWICH PANELS. PHASE 2: THIN GAGE MATERIAL MANUFACTURE
J. B. Merlette Feb. 1972 55 p
(Contract NAS9-11368)
(NASA-CR-115637; H400-12-1-11) Avail: NTIS HC $4.75 CSCL 13H

Thin gage materials selected and the rationale for their basic requirements are discussed. The resin used in all prepreg manufacture is Monsanto RS-6234 polyimide. The selected fiber for core manufacture is Hercules HT-S, and the selected fiber for face sheets is Hercules HM-S. The technique for making thin gage prepreg was to wind spread carbon fiber tows into a resin film on a large drum. This technique was found to be superior to others investigated. A total of 22 pounds of 1 to 2 mil/ply prepreg was fabricated for use on the program. Author

N72-24534# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
MICROSTRUCTURAL OBSERVATIONS OF FUSION WELDED BORON-ALUMINUM COMPOSITES
J. Kennedy May 1972 17 p refs
(RM-542) Avail: NTIS HC $3.00

Welding studies were conducted on boron aluminum composites to observe the effects of gas tungsten arc fusion welding on the boron reinforcing filaments and aluminum matrix. The objective of this investigation was to determine the basic potential of fusion welding B/Al composites for possible structural applications. Microstructural observations after welding revealed matrix fusion without apparent boron filament damage. Analysis of weld metal regions indicated that aluminum filler metal additions intermixed with the matrix and altered its chemical composition. It is concluded that fusion welding of B/Al

composites may be possible by control of welding energy input.
Author

N72-24535*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LUBRICATING CHARACTERISTICS OF POLYIMIDE BONDED GRAPHITE FLUORIDE AND POLYIMIDE THIN FILMS
Robert L. Fusaro and Harold E. Sliney 1972 20 p refs Proposed for Presentation at Intern. Lubrication Conf., New York, 9-12 Oct. 1972; Sponsored by ASME and Am. Soc. of Lubrication Engr.
(NASA-TM-X-68017; E-6815) Avail: NTIS HC $3.00 CSCL 11H

A friction and wear life study was conducted on the use of a polyimide (PI) varnish as a binder for the solid lubricant, graphite fluoride (CF(1.1))N. Also studied were the lubricating properties of PI thin films with no solid lubricant additives. For comparison, similar experiments on PI-bonded MoS2 and burnished films of MoS2 or (CF(li))N were conducted. The best results were obtained with the PI-bonded (CF(1.1))N films. The polyimide thin films (with no solid lubricant additives) did not lubricate well at 25 C; however, when heated to 100 C, low friction and long wear lives were obtained. Author

N72-24536*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STATE-OF-TECHNOLOGY FOR JOINING TD-NiCR SHEET
Kenneth H. Holko, Thomas J. Moore, and Charles A. Gyorgak [1972] 28 p refs Proposed for presentation at 2d Intern. Symp. on Superalloys, Seven Springs, Pa., 18-20 Sep. 1972; Sponsored by Am. Inst. of Met. Engr.
(NASA-TM-X-68070; E-6954) Avail: NTIS HC $3.50 CSCL 13H

At the current state-of-technology there are many joining processes that can be used to make sound welds in TD-NiCr sheet. Some of these that are described in this report are electron beam welding, gas-tungsten arc welding, diffusion welding, resistance spot welding, resistance seam welding, and brazing. The strengths of the welds made by the various processes show considerable variation, especially at elevated temperatures. Most of the fusion welding processes tend to give weak welds at elevated temperatures (with the exception of fusion-type resistance spotwelds). However, solid-state welds have been made with parent metal properties. The process used for a specific application will be dictated by the specific joint requirements. In highly stressed joints at elevated temperatures, one of the solid-state processes, such as DFW, RSW (solid-state or fusion), and RSEW, offer the most promise. Author

N72-24537# Denver Research Inst., Colo.
X-RAY STRUCTURAL ANALYSIS OF METAL-HYDROGEN SYSTEMS Final Report, 1 Feb. 1970 - 15 June 1971
Charles E. Lundin and R. L. Sullivan Jun. 1971 65 p ref Sponsored by AEC Prepared for Sandia Corp., Albuquerque, N. Mex.
(Contract SC-11-0097)
(DRI-2573; SC-CR-715133) Avail: NTIS

The surface area of the thin film was the principal region of interest because of its environmental contamination and the deterrent effect on hydriding to a homogeneous composition. The techniques employed were metallography, X-ray diffraction analysis, and scanning electron microscopy. Various film thicknesses, processing variables, and substrates were investigated. The scandium thin films appeared to be more susceptible to contamination than erbium films, as deduced from the hydriding propensity. Air exposure after preparing the metallic films was the most serious contaminant of the surface. Subsequent hydriding became difficult to conduct resulting in inhomogeneous loading. Studies of means to alleviate hydriding and loading problems resulted in evolving a process of preloading the films with hydrogen in the thin film evaporator. Subsequent air transfer to a hydriding apparatus was found to have less contaminating effect. Author (NSA)

N72-24538# Hanford Engineering Development Lab., Richland, Wash.
X-RAY REAL-TIME IMAGING FOR NONDESTRUCTIVE TESTING OF FAST FLUX TEST FACILITY FUEL PINS
C. N. Jackson, Jr. and W. H. Gray Sep. 1971 21 p refs
(Contract AT(45-1)-2170)
(HEDL-TME-71-135) Avail: NTIS

The system consists of a shielded facility, an X-ray generating unit and an X-ray sensitive vidicon camera closed circuit video system. Both dynamic and static inspection of fuel pin internal components can be made. Axial and linear modes of an individual fuel pin motion or synchronized rotation of six fuel pins is possible. Also the pins may be indexed in increments of 30 deg. A digital display measuring system permits linear measurement of internal parameters such as fuel column length and pellet location. The system employs two new components for imaging of materials, i.e., a beryllium window 260 kV X-ray tube and a lead oxide photo conductive target in the X-ray vidicon tube. The overall efficiency of the X-ray-sensitive vidicon is greatest when an abundance of low X-radiation energy is available. The beryllium window X-ray tube reduces the inherent filtration common to other X-ray tube materials, and thus makes more low energy radiation available to the vidicon target. The higher kV X-ray tube supplies a higher maximum energy for greater penetration of the fuel pin material. Author (NSA)

N72-24539# Laboratoire d'Automatique et de Ses Applications Spatiales, Toulouse (France).
CONTRIBUTION TO THE DESIGN OF NUMERICAL CONTROL ELEMENTS: PROJECT ASMODEE [CONTRIBUTION A LA CONCEPTION D'ORGANES NUMERIQUES DE COMMANDE PROJET ASMODEE]
A. Costes, J. C. Laprie, M. Briot, and A. AlabauMunoz 1971 13 p refs In FRENCH Presented at the Assoc. Franc. pour la Cybernetique Econ. et Tech. Workshop on Automatismes Logiques Industriels: Conception et Realisation, Paris, Dec. 1971
(LAAS-861) Avail: NTIS HC $3.00

Research into real time automatic control of processes is described. A technique intermediate between the pre-wired arrangement and a minicomputer was adopted. The design and operation of the control unit are described and the technological solution adopted is discussed. Integrated circuits including complex circuits such as MSI, LSI, and bus conductors are used, resulting in hardware which can perform functions more usually provided by software. Author (ESRO)

N72-24540# Ghent Univ. (Belgium). Lab. of Materials Resistance.
WELDING DEFECTS [DEFAUTS DE SOUDURE]
Arnold Sys (Centre de Rech. Sci. et Tech. de l'Ind. des Fabric. Metal.) Brussels Centre de Rech. Sci. et Tech. de l'Ind. des Fabric. Metal. Jan. 1972 65 p refs In FRENCH Sponsored by IRSIA
(CRIF-MT-75) Avail: NTIS HC $5.25

The influence of defects on the resistance of welded joints, under static stress, under very weak fatigue stress is discussed. Research was carried out on 18 millimeter-thick steel tanks with longitudinal welds in which drosses, porosities, and lack of penetration were present. It is shown that no noticeable alteration of the resistance of the weld line occurs provided that drosses have an internal surface less than 50 square millimeters, porosities have a diameter not exceeding two millimeters and lack of penetration does not exceed six millimeters, although this length may probably exceed ten millimeters, the ultimate limit was not evaluated. Other defects such as out of roundness, flats or channels at the base of the joint are shown to be more detrimental on welded joint resistance. Author (ESRO)

N72-24541# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
PUMPS, LIQUID
7 Feb. 1972 7 p refs
(AD-737713; TOP-9-3-314) Avail: NTIS CSCL 13/11

The report describes a method for evaluation of liquid pump operational and functional performance characteristics. Supporting tests, facilities, and equipment required are identified, and procedures for functional performance tests are provided.
Author (GRA)

N72-24542# Martin Marietta Corp., Denver, Colo.
CENTER FOR HIGH ENERGY FORMING Interim Report
I. R. Kramer, Jimmy D. Mote (E. F. Industries, Inc., Louisville, Colo.), and Arthur A. Ezra (Denver Univ.) Jan. 1972 28 p
(Contract DA-19-066-AMC-266(X))
(AD-737719; AMMRC-CR-66-05/30) Avail: NTIS CSCL 13/8

A description is given of the areas in applied research where definite programs pointed toward hardware applications are already established. These include thick walled tube expansion, die stresses, and applications of explosive welding to hardware configurations. The work on explosive expansion of thick walled tubes is directed toward reduction of process cost and an accurate determination of the process economics. Explosive compaction of metal powders is directed toward production of forging preforms for turbine discs, turbine buckets, etc. The explosive welding work will concentrate on the production of components applicable to helicopter spars, rotors, hubs, and dual hardware armor.
Author (GRA)

N72-24543# Auburn Univ., Ala.
AUTOMATIC DESIGN
William H. Bussell, Zia Ur Rahmam, and Salim Khalid Dec. 1971 344 p refs
(Contract DAAH01-68-C-0296)
(AD-737667; AU-T-21) Avail: NTIS CSCL 13/9

A design system concept has been developed for machines in which a force of motion transformation is involved. The system, designed to utilize the computational facility, programmable logic and information storage capability of digital computers, is intended to combine stored programs and information storage capability, to facilitate design by automation and to be operable in both interactive and batch processing modes. The basis of the system is the design of mechanisms, and it utilizes preprogrammed methods. Thus mechanism synthesis, kinematic and force analyses, with schemes for parts configuration assignment and development of dynamic characteristics are combined to develop an automatic mechanism design system. A scheme for the development of automatic component design is also described, with a number of programs or program definitions for completing the development. Program listings and user instructions are included.
Author (GRA)

N72-24544# Bendix Corp., Southfield, Mich.
TESTING OF A PNEUMATIC SERVOMECHANISM Final Report, Oct. 1967 - Mar. 1971
Kenneth W. Verge and Ronald G. Read Wright-Patterson AFB, Ohio AFFDL Feb. 1972 201 p
(Contract F33615-67-C-1196; AF Proj. 8226)
(AD-738345; RLD-5462; AFFDL-TR-71-146) Avail: NTIS CSCL 13/7

A unique low pressure pneumatic, high torque rotary actuation technique applicable to aircraft primary or standby flight control is described. This drive, the Bendix Dynavector actuator, incorporates an integrated captive vane orbital pneumatic motor with a high ratio epicyclic transmission. The demonstration of this rotary actuator technology has been accomplished by the design, fabrication and testing of two 10,000 lb-in torque capacity drives designated models PH-391-U1 and U2.
Author (GRA)

N72-24545# Midwest Research Inst., Kansas City, Mo.
THE DENSITY AND SURFACE TENSION OF SYNTHETIC TURBINE ENGINE LUBRICANTS FROM 100 TO 400 F Technical Report, Jun. 1969 - Sep. 1971
Steven K. Davis, Allen E. Turner, and Ronald D. Butler Wright-Patterson AFB, Ohio AFAPL Feb. 1972 68 p refs
(Contract F33615-69-C-1265; AF Proj. 3048)
(AD-738319; AFAPL-TR-71-104) Avail: NTIS CSCL 11/8

The report describes techniques for experimental determination of the density and surface tension of synthetic turbine engine lubrications over the temperature range 100 - 400 F. Density values are reported for 22 lubricants, and surface tension values for 19 lubricants. Least-squares analysis reveals how density and surface tension vary with temperature according to a general formula. Parameters are tabulated for each of the fluids studied. The significance of density and surface tension data for lubrication engineering is discussed. Examples are given in which lubricant behavior can be explained and understood in terms of these properties.
GRA

N72-24546# TRW Systems Group, Redondo Beach, Calif. Advanced Technology Staff Group.
NONDESTRUCTIVE TESTING USING TRW ACOUSTO-OPTICAL IMAGING SYSTEM Interim Report, 1 Jul. 1971 - 1 Jan. 1972
Robert Aprahamian, Jerold L. Jacoby, and Praving G. Bhuta Jan. 1972 21 p ref
(Contract DAAG46-70-C-0103; ARPA Order 1245)
(AD-738173; AMMRC-CR-71-4/3) Avail: NTIS CSCL 14/2

The technique of acousto-optical imaging (AOI) enables one to 'see,' on a real-time basis, within optically opaque materials and to detect internal or surface flaws and/or other irregularities which might be present. The process uses an ultrasonic beam to probe the object under study. As it interacts with the object, the ultrasonic beam acquires an acoustical 'picture' of the object. The acoustic waves then interact with a monochromatic light beam (as from a laser). Optical sidebands are produced by the Bragg diffraction of light. The cumulative result of this process is that these sidebands produce a visual image of the interior of the object. The report discusses the results of an analytical and experimental study to evaluate the applicability of acousto-optical imaging to nondestructive testing.
GRA

N72-24547# Dynamic Science, Phoenix, Ariz.
EVALUATION OF SELF-SEALING BREAKAWAY VALVES FOR CRASHWORTHY AIRCRAFT FUEL SYSTEMS Final Report
Bruce Anson Fort Eustis, Va. USAAMRDL Nov. 1971 75 p
(Contract DAAJ02-70-C-0038; DAAJ02-67-C-0004; DA Proj. 1F1-64204-D-154)
(AD-738204; Rept-4820-71-25; USAAMRDL-TR-71-65) Avail: NTIS CSCL 13/11

A program was aimed at improving the component performance characteristics of breakaway valves used to eliminate fuel spillage and subsequent fire in otherwise survivable aircraft crashes. It consisted of an initial study and literature survey to establish the state of the art followed by two series of static and dynamic tests of various types of valves to define problem areas and to verify that the problems had been corrected. An analysis to correct the indicated deficiencies was accomplished between the two test phases. The results were then collated into a draft military specification.
GRA

N72-24548# Army Chemical Center, Edgewood, Md.
VIBRATING CAPILLARY DEVICE FOR PRODUCTION OF UNIFORM SIZED DROPLETS
William A. Cooper Feb. 1972 18 p refs
(DA Proj. 1B0-62116-A-084)
(AD-738252; EA-TR-4614) Avail: NTIS CSCL 13/7

A vibrating capillary device for producing uniform-sized liquid droplets at a constant and known rate has been constructed and experimentally tested. The droplet generation technique applies the principle that a cylinder of liquid is dynamically unstable under the action of surface tension. When a regular mechanical disturbance within a specified wavelength range is applied to a liquid jet, the jet will disintegrate into a stream of uniform-sized droplets. The size of the droplets produced depends on the diameter of the capillary through which the liquid flows and the frequency of the impressed disturbance. An electrome-

chanical vibrator and frequency generator were used to create the capillary wave, and uniform-sized water droplets in the range of 130 to 212 microns in diameter were obtained. The results suggest that a series of capillary tubes with diameters of 1, 1.5, 2.3, 3.3 and 5 mils would produce the entire spectrum of droplets in the range of 40- to 300-micron diameters.
Author (GRA)

N72-24549# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SOLDERING OF GOLD THIN FILMS
Gaspar Hedrig 13 Dec. 1971 34 p refs Transl. into ENGLISH from Finomechanika (Hungary), v. 9, no. 4, 1970 p 108-118
(Contract F33657-71-D-0057; AF Proj. 7343)
(AD-737885; FTD-HC-23-887-70) Avail: NTIS CSCL 13/8

Soldering of gold thin films and of gold-plated leads to electronic components has for the past several years been of increasing interest to workers in the field. The author surveys the available literature for the theoretical and practical results and problems of recent work in the field. The phase diagram for the ternary system of gold, tin, and lead is discussed in detail, as are the conditions that generate the various phases, and the factors that affect the strength of soldered joints. Other subjects discussed include the melting and diffusion of gold in tin-lead solders, and the results of studies into the characteristics of soldered joints. Author (GRA)

16 MASERS

Includes applications of masers and lasers. For basic research see: 26 Physics, Solid State.

N72-24550 Japan Broadcasting Corp., Tokyo.
AUTOMATIC ACQUISITION AND TRACKING SYSTEM FOR LASER COMMUNICATION
Toshio Motoki, Yukio Sugiura, and Takao Chiba Oct. 1971 11 p refs
(NHK-Labs-Note-145) Copyright. Avail: Issuing Activity

A laser communication system, which has an automatic acquisition and tracking capability without the aid of any other communication link, was constructed. It consists of two terminals that can transmit one TV signal and error signals for tracking each other. The heart of this system is a combination of a laser, a position sensor, an angle detector, and an optical deflector that can send back a laser beam parallel to an incident beam as if it were a retro-reflector. The availability of this system was proved from a transmission experiment at the distance of 500 m. The maximum propagation distance of this system is estimated to be 1 km, even though there are spot dancing and beam spreads, if a 200 mm diameter receiving aperture is used. Author

N72-24551# National Defense Research Organization TNO, The Hague (Netherlands). Physics Lab.
MEASUREMENTS ON PULSED NEODYMIUM LASERS
G. C. Dubbeldam Mar. 1971 45 p refs In DUTCH; ENGLISH summary
(PHL-1971-13; TDCK-58291) Avail: NTIS HC $4.25

The results are presented for research experiments on a laser rangefinder during the period September 1969 to February 1971. A method to adjust a pulse laser with a rotating prism as a Q switch is given. The results achieved with the experimental laser rangefinder, and methods of adjusting are described. Experiments with a pulse laser provided with a YAG + Nd(3+) rod and either a rotating prism or an electro-optical shutter as a Q switch are described. A summary of the theory of the electro-optical shutter is given. Using a YAG laser with an electro-optical shutter as a Q switch, pulses of 5 MW height and 15 nsec length were obtained. Author

N72-24552# Technisch Physisch Dienst TNO-TH, Delft (Netherlands). Afdeling Optiek.
RESEARCH ON QUANTITY MEASUREMENT WITH A LASER DOPPLER VELOCITY METER [ONDERZOEK AAN MEETVOLUME VAN EEN LASER DOPPLER SNELHEIDS-METER]
N. B. Oosterveld and H. J. Raterink 20 Dec. 1971 50 p refs In DUTCH; ENGLISH summary
(TPD Proj. A70/KM/155)
(TPD-1971-0-1-(105.108); TDCK-059111) Avail: NTIS HC $4.50

The use of a laser-Doppler velocity meter (LDV) to measure velocities of fluids and gases without disturbing the moving medium is discussed. The principle of the LDV is based on the scattering of light by flowing particles. The dual-scatter method is used to describe the LDV. By focusing two coherent laser beams by means of a positive lens, an interference pattern arises. The accuracy of velocity measurements is affected by the change in the distance between the interference fringes in the probe volume. Analytical and numerical calculations concerning the shape of the interference fringes are presented. The results show that the divergence of the laserbeam has an important influence upon the change of the distance between the fringes. The influence upon the interference pattern by changing the following parameters is verified. Author

N72-24553# Addis Translations International, Woodside, Calif.
HIGH-POWER LASER UNIT WITH A SERIES-PARALLEL SYSTEM OF AMPLIFIERS FOR PLASMA HEATING
N. G. Basov, O. N. Krokhin, G. V. Sklizkov, S. I. Fedotov, and A. S. Shikanov [1971] 20 p refs Transl. into ENGLISH from "Moshchnaya Lazernaya Ustanovka s Posledova-Telno-Parallelnoi Sistemoi Usilitelei diya Nagreva Plazmy", Acad. of Sci., Moscow, preprint no. 123 Sponsored by AEC Prepared for UCRL, Livermore
(UCRL-Trans-10580; Rept-123) Avail: NTIS

A description is given of an experimental laser installation for the high temperature heating of solid targets. This is done using a high power neodymium glass laser with pulse length adjustable in the range between 2 and 16 nsec and radiation energy between 600 and 1300 J. The light pulse is produced with the aid of an electro-optic shutter controlled by a laser-triggered discharge gap. The contrast of the radiation at the exit from the installation is about 10 to the -7th power. It was found that the maximum output energy of the laser decreases with decreasing pulse length. Preliminary experiments were carried out on the heating of a spherical polyethylene target. The heated plasma diagnostics were based on the use of a system of ultrahigh speed photography in the beam of a ruby laser. Measurements of the velocity of the spherical shock wave produced as a result of the expansion of the target in the gas were used to determine the energy absorbed by the plasma, which in these experiments amounted to 300 J for a pulse length of 2 nsec. Author (NSA)

N72-24554# Centre National de Documentation Scientifique et Technique, Brussels (Belgium).
USES OF LASERS IN PLASMA PHYSICS Selected Bibliography, 1965 - 1970
Jacques Piron, comp. Aug. 1971 136 p refs
(NCWTD-CNDST-Bib-3) Avail: AEC Depository Libraries

This bibliography covers the period 1965 to 1970 and contains 582 references. NSA

N72-24555# National Defense Research Organization TNO, The Hague (Netherlands).
TIME-DEPENDENT SPECTROSCOPIC MEASUREMENTS ON A PULSED GaAs LASER DIODE
J. G. W. vanKampen May 1971 14 p refs In DUTCH; ENGLISH summary
(PHL-1971-22; TDCK-58615) Avail: NTIS HC $3.00

The spectrum of the laser radiation (approximately 0.9 micron) pulsed GaAs diode was determined with sampling

techniques as a function of the time at room temperature. From the shift of the spectral modes a rise of junction temperature of 31 K was calculated during the pulse (approximately 200 nsec); the mean temperature rises 15 K. Author

N72-24556# Office of Naval Research, London (England).
ESFAHAN SYMPOSIUM ON FUNDAMENTAL AND APPLIED LASER PHYSICS
William J. Condell 18 Jan. 1972 18 p refs Conf. held at Esfahan, Iran, 29 Aug. - 5 Sep. 1971
(AD-737608; ONRL-C-1-72) Avail: NTIS CSCL 20/5

An abbreviated report of selected papers given at the Esfahan Symposium on Fundamental and Applied Laser Physics, 29 August - 5 September 1971, is given. Author (GRA)

N72-24557# American Optical Co., Southbridge, Mass. Central Research Lab.
NEODYMIUM LASER GLASS IMPROVEMENT PROGRAM
Technical Summary Report, 1 Jul. - 31 Dec. 1965
R. F. Woodcock Oct. 1971 16 p ref
(Contract Nonr-3835(00); ARPA Order 306)
(AD-737627; TR-598-7) Avail: NTIS CSCL 20/5

Efforts during this six month period were a continuation of the investigation of athermalized laser glass materials. Equations were derived for change in optical pathlength, which make it possible to identify two conditions for which athermalization is satisfied. The method used for measurement of thermal coefficient of refraction index is described. Thirty-three glasses were measured and results are given. Finally, search for a material with zero stress birefringence continued. A regression analysis of the stress birefringence coefficient as a function of glass composition was performed on 51 glasses and results are tabulated. Author (GRA)

N72-24558# Catholic Univ. of America, Washington, D.C. Dept. of Chemistry.
INFRARED LASERS AND INFRARED SPECTRA OF FREE RADICALS Annual Report
F. X. Powell 1971 10 p refs
(Contract N00014-67-A-0377-0010)
(AD-737710) Avail: NTIS CSCL 20/5

Briefly summarized is research concerning the achievement of CW laser action in various atom-molecule reactions, in particular HCl and CO lasers. The methods which were to be employed were detailed in the original proposal and comprised a highpower magnetic induction discharge for the generation of atoms and a high speed flow system where these atoms were to be titrated by stable adducts. The initial series of experiments are reported. Author (GRA)

N72-24559# GTE Sylvania, Inc., Mountain View, Calif. Electronic Systems Group-West.
SUN PUMPED LASERS Final Technical Report, 1 Jan. 1970 - 1 Sep. 1971
Lloyd Huff 1 Sep. 1971 140 p refs
(Contract F33615-70-C-1255; AF Proj. 5244)
(AD-737787; AFAL-TR-71-315) Avail: NTIS CSCL 20/5

Results of an experimental program to determine the practicality of solar pumping a spaceborne optical communication laser are described. A feasibility model sun pumped Nd:YAG laser utilizing techniques compatible with space operation was built and successfully operated. Using a 24 inch diameter sun collecting mirror and an optical system which rejected the sun's IR radiation, a power output of 1.6 watts was obtained from the laser. Without the IR filtering (which also rejected some useful pump light) an output power of 1.2 watts was achieved with half of the telescope aperture area. Mode locked operation of the device at a rate of 500 MHz was also demonstrated. Based on sun pumped laser performance achieved during the program, it is projected that a laser output power of 1.6 watts can be obtained outside the earth's atmosphere with a 12 inch diameter mirror. Author (GRA)

N72-24560# Informatics TISCO, Inc., Riverdale, Md.
EFFECTS OF HIGH POWER LASERS
Stuart G. Hibben Dec. 1971 110 p refs
(Contract F44620-70-C-0081; ARPA Order 1622)
(AD-737570; AFOSR-72-0486TR) Avail: NTIS CSCL 20/5

The report contains a compilation of abstracts and one survey article on Soviet research in high power laser effects, published in the June 1969 - June 1971 interval. The following topics are discussed: Laser breakdown of gas; Laser interaction with plasma; Laser interaction with metals; Laser interaction with dielectrics; Laser interaction with semiconductors; Laser interaction with liquids; Laser interaction with miscellaneous materials; Theory of laser interaction with material; Conferences; Dynamics of laser interaction with solids--review. GRA

N72-24561# Aerospace Corp., El Segundo, Calif. Lab. Operations.
A REVIEW OF RATE COEFFICIENTS FOR REACTIONS IN THE H2-F2 LASER SYSTEM Technical Report, Jul. 1970 - Jun. 1971
Norman Cohen 3 Sep. 1971 48 p refs
(Contract F04701-71-C-0172)
(AD-737553; TR-0172(2779)-2; SAMSO-TR-72-23) Avail: NTIS CSCL 20/5

The chemical and energy transfer reactions involved in the hydrogen fluoride chemical laser system are discussed. Current experimental and theoretical evidence relevant to a selection of the most probable values of rate coefficients is reviewed, and a set of 'best' values is recommended. Author (GRA)

N72-24562# Informatics TISCO, Inc., Riverdale, Md.
BIBLIOGRAPHY OF SOVIET LASER DEVELOPMENTS Interim Report, Jul. - Sep. 1971
Stuart G. Hibben 2 Dec. 1971 95 p refs
(Contract F44620-70-C-0081; ARPA Order 1622)
(AD-737535; AFOSR-72-0485TR; IR-5) Avail: NTIS CSCL 20/5

The report covers the third quarter of 1971 with the major yield of information coming from the approximately 30 periodicals known to report the most advanced and interesting findings in Soviet laser technology. This as well as the previous four reports covers the following topics: (1) laser research solid state, liquid, gas and chemical lasers, UV, components, nonlinear optics, spectroscopy of laser materials, short pulse generation, crystal growing, and general theory; (2) laser applications -- biological effects, communications, computer technology, holography, instrumentation, materials processing, and plasma generation. Author (GRA)

N72-24563# Army Missile Command, Redstone Arsenal, Ala. Physical Sciences Directorate.
ELECTRON BEAM CONTROLLED CO2 LASERS
Charles Cason, Richard E. Ely, T. E. Horton, and Steven J. Kast Nov. 1971 43 p refs
(DA Proj. 1T6-62705-A-308)
(AD-738109; RR-TR-71-14) Avail: NTIS CSCL 20/5

A proposed two-year research program, to include both theoretical and experimental studies, would be directed toward development of an electron-beam-controlled CO2 laser operable at pressures up to 10 atmospheres. Evidence of the feasibility of such a project is provided by various analyses and calculations, including a new method of defining pressure scaling relationships, and by a preliminary complement of design and operating parameters based on these analyses and on current, related experiments. Results obtained from specific examples indicate output laser energies of 37 and 570 joules/liter are possible for 1 and 10 atm respectively. Most critical problem at present is lack of definitive and accurate data on optical window materials and geometries at the higher pressures, but three materials appear promising for this application. Author (GRA)

N72-24564# Raytheon Co., Waltham, Mass. Research Div.
EXPERIMENTATION AND INVESTIGATION OF OPTICAL-IRRADIATION-INDUCED SURFACE DAMAGE IN OPTICALLY NONLINEAR MATERIALS Scientific Report, 1 May 1970 - 31 Oct. 1971
Michael Bass, Harrison H. Barrett, and Lowell H. Holway, Jr. Feb. 1972 130 p refs
(Contract F19628-70-C-0223; ARPA Order 1434)
(AD-737843; AFCRL-71-0573; S-1378; SR-1) Avail: NTIS CSCL 20/5

Surface damage to optically nonlinear materials has been studied both experimentally and theoretically. A model for the damaging process, based on the probability measurements and electron avalanche breakdown, has been devised. In its simplest form, this model has successfully explained the most important properties of the measured damage probability in over 10 different materials. This model is being refined to examine such areas as the dependence of damage probability on laser frequency and the temporal distribution of breakdown starting times. The present program has also explained the difference between damage produced by multimode and TEM(00) mode laser beams, shown that the form of damage (whether on the surfaces or in the volume) depends on the laser beam geometry and has demonstrated, using streak camera photography, the upstream movement of the beam focal point under self-focusing conditions. In addition, a refined theoretical analysis of self-focusing with both instantaneous and finite response-time mechanisms has been developed. Author (GRA)

N72-24565# Washington Univ., St. Louis, Mo. Dept. of Electrical Engineering.
MODE LOCKING OF COUPLED TRANSITIONS IN KRYPTON LASERS
James S. Brookman, Jr. and William S. C. Chang Jan. 1972 96 p refs
(Contract F44620-69-C-0121; AF Proj. 9559)
(AD-738328; AFOSR-72-0577TR) Avail: NTIS CSCL 20/5

A novel technique is described in full detail for selectively mode-locking any one oscillating transition, in a laser that has several simultaneously oscillating transitions, without directly locking the others. Detailed experiments were performed showing the effects of the mode-locked pulse on the other oscillating transitions. Based on the experimental results obtained, a theory is developed in terms of the common lower state lifetime for the competing transitions. Author (GRA)

N72-24566# Defence Research Information Centre, Orpington (England).
ON THE POSSIBILITY OF PRODUCING A CO2 LASER WITH A PUMPED ELECTRON BEAM
G. G. Dolgov-Saleiev et al Mar. 1972 6 p refs Transl. into ENGLISH from Zh. Prikl. Spektroskoppi, Akad. Nauk Belorussk. SSR (Minsk), v. 12, no. 4, 1970 p 737-739
(AD-738419; DRIC-Trans-2710; BR30089) Avail: NTIS CSCL 20/5

The possibility of producing a high amplification ratio laser in gaseous media with a pumped beam of charged particles is considered. A CO2 pulsed laser is studied when a bunch of electrons with energy E approximately equal to 0.5 Mev is introduced across the discharge interval. GRA

N72-24567# California Inst. of Tech., Pasadena. Div. of Engineering and Applied Science.
MODERN OPTICS Final Report 1968 - 1971
Nicholas George and Richard B. MacAnally Feb. 1972 25 p refs
(Grant AF-AFOSR-1492-68; AF Proj. 9768)
(AD-737521; AFOSR-72-0372TR) Avail: NTIS CSCL 20/5

Theoretical and experimental research is being conducted in the field of modern optics. The goal is to contribute solutions for important specific problems in the generation, propagation, properties, and uses of coherent electromagnetic radiation. Research activities under AFOSR sponsorship are summarized in this final report for the period from 1968 through 1971. Subjects of research interest have been grouped into two main areas: (1) Holography and Optical Data Processing and (2) Nonlinear Optics. Specific topics in holography and optical data processing have included holographic stereograms, blurred image restoration, real time recording, and matched filtering. In nonlinear optics and lasers the studies include the origin of the nonlinear refractive index, infrared absorption and fluorescence, and saturation phenomena in magnetically tuned laser amplifiers. Author (GRA)

17 MATERIALS, METALLIC

Includes cermets; corrosion; physical and mechanical properties of materials; metallurgy; and applications as structural materials. For basic research see: 06 Chemistry. For related information see also: 18 Materials, Nonmetallic; and 32 Structural Mechanics.

N72-24568# Joint Publications Research Service, Arlington, Va.
MECHANICAL PROPERTIES OF INDUSTRIAL NONFERROUS METALS AT LOW TEMPERATURES
S. I. Gudkov 2 May 1972 353 p refs Transl. into ENGLISH of the Publ. 'Mekhanicheskiye Svoystva Promyshlennykh Tsvetnykh Metallov pri Nizkikh Temperaturakh" Moscow, Met. Publishing House, 14 Jun. 1971 304 p
(JPRS-55861) Avail: NTIS HC $19.75

Data are classified and generalized for the thermophysical and mechanical properties of the nonferrous metals and alloys that are most widely used in technology at temperatures from +20 to -269 C. For each type of alloy the chemical composition and mechanical properties of the semi-finished product are indicated, as well as the designation from the All-Union State Standards (AUSS) or the Technical Specifications (TS). Data are cited in the form of tables and graphs on the physical (heat expansion, thermal conductivity, heat capacity) and the mechanical (strength, plasticity, impact strength, and fatigue) properties of the base metal, as well as for the welded and soldered joints. Author

N72-24569# Technische Hogeschool, Delft (Netherlands).
COBALT AND THE NICKELIFEROUS LIMONITES: A MULTIDISCIPLINARY STUDY ON THE MAXIMUM UTILIZATION OF ORE Ph.D. Thesis
Paul Etienne Queneau 16 Dec. 1971 254 p refs
Avail: NTIS HC $14.75

The history, uses, production, and economic future of cobalt are examined. The geochemistry and mineralogy of nickeliferous limonites are discussed in detail, with emphasis on aspects important to the extractive metallurgist. Consideration is also given to silicate-type nickel ores. The mining and extractive metallurgy of nickeliferous limonite are examined, with emphasis on maximum utilization of the ore. Procedures are outlined for recovering nickel, cobalt, chromium, and iron contents as saleable products. A process is proposed for cobalt and nickel extraction based on chlorine metallurgy. The results of laboratory experiments are presented. Author

N72-24570# Bureau of Mines, Boulder City, Nev. Metallurgy Research Lab.
ELECTROLYTIC PREPARATION OF BERYLLIUM-COPPER ALLOYS
D. E. Kirby, D. A. OKeefe, and T. A. Sullivan 1972 16 p refs
(BM-RI-7629) Avail: NTIS HC $3.00

In the preparation of beryllium-copper alloys by fused salt electrolysis, beryllium was electro-won from beryllium oxide dissolved in fluoride electrolytes and deposited on copper cathodes. At 880 to 1,030 C, deposition was on solid cathodes. Beryllium was deposited on the copper, forming a liquid alloy that dripped from the cathode. Dripping alloys containing 3 to 4

weight percent beryllium were produced with as high as 90 percent cathode current efficiency, by electrolysis at 910 C. To prepare alloys of higher beryllium content, attempts were made at depositing beryllium on liquid copper cathodes. These efforts were generally unsuccessful, although alloys containing as much as 12 percent beryllium were prepared by this method. At temperature of 1,100 to 1,300 C. requisite to maintaining beryllium-copper compositions as liquids, the beryllium reacted with cell structures. Author

N72-24571# Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF CRACKS DURING WELDING OF EP199 ALLOY
V. P. Moiseyenko, L. I. Mirgorodskiy, O. G. Krasnov, and O. A. Samokhvalova 16 May 1972 6 p ref Transl. into ENGLISH from Svarochn. Proizv. (Moscow), no. 8, 1970 p 28-29
(JPRS-56003) Avail: NTIS HC $3.00

The cause of cracks during welding of thermally hardened nickel based EP199 alloy, alloyed with chromium, titanium and molybdenum was examined. Test data are presented and changes in the initial austenitic structure in specimens heated to 1,230 and 1,330 degrees C is noted. It is concluded that a main cause of microcracks is concentrated coarse separations in the eutectic, and that the amount of eutectic formed increases as the temperature rises. Above 1,280 degrees C, the grain boundaries fuse, producing a sharp reduction in plasticity of the near-seam zone. Microcracks form as the metal cools. Author

N72-24572*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OXIDATION AND THERMAL FATIGUE OF COATED AND UNCOATED NX-188 NICKEL-BASE ALLOY IN A HIGH VELOCITY GAS STREAM
James R. Johnson and Stanley G. Young Washington May 1972 41 p refs
(NASA-TN-D-6795; E-6778) Avail: NTIS HC $3.00 CSCL 11F

A cast nickel-base superalloy, NX-188, coated and uncoated, was tested in a high-velocity gas stream for resistance to oxidation and thermal fatigue by cycling between room temperature and 980, 1040, and 1090 C. Contrary to the behavior of more conventional nickel-base alloys, uncoated NX-188 exhibited the greatest weight loss at the lowest test temperature. In general, on the basis of weight change and metallographic observations a coating consisting of vapor-deposited Fe-Cr-Al-Y over a chromized substrate exhibited the best overall performance in resistance to oxidation and thermal fatigue. Author

N72-24573*# Lockheed Missiles and Space Co., Sunnyvale, Calif. Space Systems Div.
MANUFACTURE, ASSEMBLY, AND DELIVERY OF BERYLLIUM TEST PANELS Final Report
15 Mar. 1972 80 p refs
(Contract NAS8-27074)
(NASA-CR-61384; LMSC-A997036) Avail: NTIS HC $6.00 CSCL 11F

Details of the fabrication and assembly of two 99 cm by 99 cm (39 in. by 39 in.) beryllium heat shield test panels are presented. Each panel consists of two hat-stiffened, formed skins which overlap a transverse slip joint at the center of the panel; clips join the two skins at the slip joint, and continuous standoffs are provided at the ends of the panel. The hat-stiffeners are joined to the skin by furnace-brazing, using the braze alloy BAg 18. The parts are generally 0.051 cm (0.020 in.) thick. Tools used to form the detail parts are shown, together with the results of preliminary forming and brazing trials to verify processing techniques. Problems encountered in the manufacture of the panels are discussed. Author

N72-24574# Joint Publications Research Service, Arlington, Va.
CRITERIA FOR EVALUATING THE TENDENCY OF TURBINE-BLADE MATERIALS TO COLD BRITTLENESS
A. A. Chizhik 15 May 1972 14 p refs Transl. into ENGLISH from Probl. Prochnosti (Moscow), no. 8, 1970 p 13-19
(JPRS-55988) Avail: NTIS HC $3.00

The tendency of metals used in the construction of steam turbines to brittle destruct is discussed. Reliable criteria for the evaluation of the brittle destruct tendencies are described. Cases of viscous and brittle destruction of turbine blades with fatigue cracks are distinguished. Since known cases of brittle destruction of turbine blades of the last stages of steam turbines are connected with the presence of fatigue cracks, it appears possible to evaluate the tendency of brittle destruct on samples with artificially induced fatigue cracks. The procedures for conducting the evaluation and the results obtained with various types of steel are reported. Author

N72-24575# Joint Publications Research Service, Arlington, Va.
NONFERROUS METALLURGY
9 May 1972 19 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Tsvet. Met. (USSR), no. 1, 1972 12 p
(JPRS-55942) Avail: NTIS HC $3.00

Metallurgical aspects of intermetallic crystal growth, phase structures of ternary tungsten alloys and ternary niobium carbon systems, and temperature effects on ultrasonic vibrations in copper are considered. For individual titles, see N72-24576 through N72-24579.

N72-24576# Joint Publications Research Service, Arlington, Va.
EFFECT OF SURFACE ACTIVE SUBSTANCES ON INTERMETALLIDE CRYSTAL GROWTH **c26**
R. R. Malinovskiy and V. I. Tararyshkin *In its* Nonferrous Met. 9 May 1972 p 112-114 refs (See N72-24575 15-17)
Avail: NTIS HC $3.00

Sodium and magnesium have an inoculating effect on aluminum alloys containing primary crystallizing intermetallic compounds. Magnesium is expedient because it has a lower solubility in aluminum alloys and remains in the solid solution during crystallization thus further hardening the alloys. G.G.

N72-24577# Joint Publications Research Service, Arlington, Va.
EFFECT OF TUNGSTEN ON THE LAVES PHASE STRUCTURE IN THE Co-Nb-W SYSTEM
K. V. Varli, N. P. Dyakonova, N. V. Orlova, and Ya. S. Umanskiy *In its* Nonferrous Met. 9 May 1972 p 115-117 refs (See N72-24575 15-17)
Avail: NTIS HC $3.00

Phase compositions and structures of alloys of the Co-Nb-W ternary system are studied. It is shown that an increase in the mean electron concentration when alloying the Co_2Nb phase with tungsten leads to a change in the lattice from the cubic ($MgCu_2$ type) to hexagonal ($MgNi_2$ type). Here, the amount of tungsten required to change the Co_2Nb lattice decreases with an increase of cobalt content in the phase. It is demonstrated that a decrease in the lattice constants of the Co_2Nb and Co_3Nb phases when alloying with tungsten is caused by replacements of the niobium atoms by tungsten atoms. Author

N72-24578# Joint Publications Research Service, Arlington, Va.
PHASE EQUILIBRIA IN THE NIOBIUM CORNER OF THE Nb-Zr-C AND Nb-Ti-C SYSTEMS
I. I. Druzhinin, A. M. Zakharov, and I. I. Novikov *In its* Nonferrous Met. 9 May 1972 p 118-120 refs (See N72-24575 15-17)
Avail: NTIS HC $3.00

Microstructural analyses confirmed the high solubility of carbon in niobium ternary alloys with the formations of Widmanstatten structures as results of insufficiently rapid cooling during quenching. The solid solution domain in the ternary Nb-Zr-C system was large when the niobium solution was in equilibrium with the carbide Nb_2C and decreased sharply when in equilibrium with the carbide (Nb, Zr)C. A drop in temperature decreased the solubility of Nb_2C in the Nb-Ti-C system more weakly than the solubility of (Nb, Zr)C in alloys of the Nb-Zr-C system. G.G.

N72-24579# Joint Publications Research Service, Arlington, Va.
EFFECT OF ULTRASONIC VIBRATIONS ON THE BLOCK STRUCTURE OF COPPER
Ye. G. Ayzentson and I. K. Utrobina *In its* Nonferrous Met. 9 May 1972 p 122-124 refs (See N72-24575 15-17)
Avail: NTIS HC $3.00

X-ray analyses of coherent dispersion regions in copper subjected to ultrasonic vibrations at different temperature regimes show that crystal dislocations increase to a saturation limit which is reached after a defined treatment time; at prolonged treatment, the copper heating effect begins to predominate and increases block sizes. It is concluded that ultrasonic vibrations cause consolidation of fine subdivisions in copper as function of thermoultrasonic treatment conditions. G.G.

N72-24580# Joint Publications Research Service, Arlington, Va.
RESEARCH ON METALS AND ALLOYS
16 May 1972 33 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Metally (Moscow), no. 1, 1972
(JPRS-56001) Avail: NTIS HC $3.75

The translated articles deal with the embrittlement of martensite-aged 000N18K9M5T steel by precipitation of titanium carbonitrides; the distribution of transition elements from the 4-6 and 8a groups between gamma and gamma' phases of heat-resistant nickel alloys; and investigation of the interaction of Nb-Mo alloys with boron. For individual titles, see N72-24581 through N72-24583.

N72-24581# Joint Publications Research Service, Arlington, Va.
EMBRITTLEMENT OF MARTENSITE-AGED 00N18K9M5T STEEL BY PRECIPITATION OF TITANIUM CARBONITRIDES
L. N. Belyakov, V. L. Nikolskaya, O. K. Revyakina, and V. V. Sachkov *In its* Res. on Metals and Alloys 16 May 1972 p 1-11 refs (See N72-24580 15-17)
Avail: NTIS HC $3.75

The embrittlement was studied of martensite-aged steels on a base of Fe = 18% Ni- Co-Mo, doped with titanium, which can be embrittled by slow cooling from 1200-1250 C as a result of the precipitation of Ti(C,N) lattices along the boundaries of the original austenite grain. The investigation was made on the temperature range of precipitation of the Ti(C,N) lattices in the 000N18K9M5T steel, their embrittling influence, and also the conditions xor altering the structures having the lattices. Author

N72-24582# Joint Publications Research Service, Arlington, Va.
DISTRIBUTION OF TRANSITION ELEMENTS FROM THE IV-VI AND VIIIa GROUPS BETWEEN GAMMA AND GAMMA' PHASES OF HEAT-RESISTANT NICKEL ALLOYS
S. T. Kishkin, M. N. Kozlova, and N. F. Lashko *In its* Res. on Metals and Alloys 16 May 1972 p 12-22 refs (See N72-24580 15-17)
Avail: NTIS HC $3.75

The establishment of the distribution of the doping elements in nickel alloys between the basic phases: solid nickel solution (gamma) and the strengthening intermetallide phases (gamma') on a base of Ni3Al or Ni3 (Al, Ti). Data on the region of uniformity of the phase of Ni3Al doped with individual transition elements have been obtained by using X-ray structural and metallographic methods of analysis. Direct determination of the composition of the gamma- and gamma'-phases of certain model nickel alloys has been done by the method of X-ray spectral local analysis. In real nickel heat-resistant alloys, other than gamma- and gamma'-phases there exist, as a rule, carbide and boride phases, and by prolonged heating at high temperatures or under operational conditions certain intermetallide phases may be formed (the sigma and mu phases and the Laves phases, etc.), which may substantially influence the distribution between the gamma- and the gamma'-phases. Author

N72-24583# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF THE INTERACTION OF Nb-Mo ALLOYS WITH BORON
G. L. Zhunkovskiy and S. M. Braun *In its* Res. on Metals and Alloys 16 May 1972 p 23-30 refs (See N72-24580 15-17)
Avail: NTIS HC $3.75

The behavior of Nb-Mo alloys at high temperatures in contact with active boron was studied. Metallographic investigation of the borated alloys showed that in the region of the solid solution, the thickness of boron diffusion varies. With an increase in the concentration of molybdenum, an abrupt decrease in the thickness of the boride layer results. Microhardness increases with an increase in the amount of the boron. It is concluded that the rate of interaction in the Nb-Mo system with boron is determined by the percentage content of the components. F.O.S.

N72-24584# Welding Inst., Cambridge (England).
AN APPROACH TO THE SELECTION OF HIGH STRENGTH STEELS BASED ON THEIR RESISTANCE TO FATIGUE AND BRITTLE FRACTURE
J. D. Harrison Nov. 1970 19 p refs
(C297/1/70) Avail: NTIS HC $3.00

A study that shows how fracture mechanics can be used to study the relationships between yield stress, design safety factors, initial defect size and service life, is presented. The results show that for any combination of conditions and required service life there is a maximum useful yield stress. There is no point in using material which exceeds this yield strength and in fact to do so is positively deleterious. The actual value of the maximum useful yield stress depends critically on the standard of fabrication and inspection and on the relationship between the normal fatigue load stress and the maximum expected stress during service, i. e. that occurring at the limit load. Finally, the report describes how the results can be used in an assessment of cumulative fatigue damage under variable amplitude loading. Author

N72-24585*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPARISON OF EXPERIMENTAL AND THEORETICAL THERMAL FATIGUE LIVES FOR FIVE NICKEL BASE ALLOYS
David A. Spera [1972] 12 p refs Presented at Symp. on Fatigue at Elevated Temp., Storrs, Conn., 18-23 Jun. 1972
(NASA-TM-X-68051; E-6852) Avail: NTIS HC $3.00 CSCL 11F

The alloys Nimonic 90, IN 100, coated IN 100, B 1900, coated B 1900, MAR M200, and MAR M200DS (directionally solidified) were studied. Maximum temperatures ranged from 770 C to 1120 C (1420 F to 2050 F). Specimen geometries included tapered disks, double-edged wedges, and cambered airfoils. The disks and wedges were heated and cooled in fluidized beds. The airfoil specimens were heated by a Mach 1 natural gas burner and rapid-air-cooled, with and without spanwise loading. Life calculations included two distinct failure modes: conventional low cycle fatigue and cyclic creep. Required material properties were limited to conventional thermal, tensile, and creep rupture data. The complete life calculation system included the calculation of transient temperature distributions, thermal strains, stresses, creep damage, fatigue damage, and cycles to first crack. Calculated lives were within a factor of two for 76 of the 86 data points analyzed. Cyclic creep accounted for 81% of all the calculated damage. Author

N72-24586# Battelle Memorial Inst., Columbus, Ohio.
MECHANICAL-PROPERTY DATA 15-5 PH STAINLESS STEEL
Feb. 1972 7 p
(Contract F33615-71-C-1261)
Avail: NTIS HC $3.00

The characteristics of 15-5 PH stainless steel are discussed. The fabrication techniques are similar to those recommended for regular grades of stainless steel. Hardening heat treatment is accomplished at 900 to 1150 degrees F, depending on the properties desired. The steel is available in the form of billets.

plate, bar, and wire. Typical applications include forgings, pump and valve parts for high pressure systems, aircraft components, and hollow bar parts for hydraulic actuators and controls.

Author

N72-24587# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'etudes Nucleaires.

INTERACTION OF DISLOCATIONS AND HYDROGEN IN NICKEL Ph.D. Thesis - Paris Univ., Orsay

Patrick Combette 1971 167 p refs In FRENCH

(CEA-R-4264) Avail: AEC Depository Libraries

An attempt was made to evaluate the interaction between hydrogen and dislocations in an fcc structure identical to that of the stainless steel used for canning nuclear fuels. A series of experiments revealed the anomalous diffusion of hydrogen in Ni between 100 and 230 K; the frequency factor and activation energy, which define the diffusion coefficient of the hydrogen, decrease simultaneously with decreasing temperature. The anomaly observed can be explained in terms of a rudimentary model of the quantum diffusion of hydrogen based on a system with two energy levels (0.41 eV and 0.23 eV). Diffusion limited by the hydrostatic stress imposed by the dislocations is envisaged. This hypothesis seems to be unlikely when it requires a very large proton migration volume. NSA

N72-24588# Bhabha Atomic Research Centre, Bombay (India).

QUENCH HARDENING IN PURE METALS

A. M. Hammad, B. D. Sharma, and P. Rodriguez 1971 38 p refs

(BARC-562) Avail: AEC Depository Libraries

Data and mechanism of quench hardening in pure metals are reviewed. Results of the quench hardening behavior of sponge zirconium are also presented. It is found that the quench temperature dependence of the increase in yield stress of zirconium specimens both for alpha- and beta-phases can be represented by a linear log delta sigma Va 1/T sub q relationship. An examination of the temperature dependence of the yield stress of beta-quenched specimens shows that the change in delta sigma is largely athermal in nature. Electron microscopic examination of the beta-quenched foils also shows that the long range stresses contributing to the athermal component can be attributed to an increase in dislocation density and other microstructural changes in the specimens.

Author (NSA)

N72-24589# Aktiebolaget Atomenergi, Studsvik (Sweden).

STUDIES OF THE TENDENCY OF INTERGRANULAR CORROSION CRACKING OF AUSTENITIC Fe-Cr-Ni ALLOYS IN HIGH PURITY WATER AT 300 C

W. Huebner, B. Johansson, and M. dePourbaix Oct. 1971 26 p refs

(AE-437) Avail: AEC Depository Libraries

Tests were carried out in high purity water at 300 C with axially stressed specimens of some commercial Fe-Cr-Ni alloys containing 10 to 75% Ni. Both sensitized and nonsensitized materials were studied, the specimens being either plain or precracked, intergranularly or transgranularly. In addition, some specimens were electrochemically etched intergranularly in localized areas. The nominal stress was varied in the range 1 to 3 times sigma sub 0.2 at 300 C. Tests were also performed with specimens stressed in a more complex way, such as U-bends. Chloride contents of less than 1 ppM and oxygen contents ranging between 0.005 and 400 ppM were studied in tests up to 1700 h. Electrochemically accelerated tests were performed with potentiostatically controlled specimens. Polarization curves were measured at temperatures up to 300 C. With uniaxially stressed specimens cracking was only found on sensitized Types 302 and 304 stainless steel, whereas U-bend tests resulted in cracking also of alloy 600 and Inconel-X 750 after less than 1500 h. Author (NSA)

N72-24590# California Univ., Berkeley.

STRUCTURE OF VAPOR DEPOSITED 4d TRANSITION METALS Ph.D. Thesis

Richard Bruce Loop Sep. 1971 38 p refs

(Contract W-7405-eng-48)

(LBL-177) Avail: NTIS

The structures of electron-beam-evaporated 4d transition metals, condensed on a helium-cooled substrate, were observed using the electron microscope. The elements observed were in the range from zirconium to ruthenium, with the samples consisting of pure elements and various binary alloys. Superconducting critical temperatures were also measured. Evidence is presented that it is possible to form transition metals in the amorphous state, regardless of composition. The stability of the amorphous phase varies with composition, with the least stability occurring for the pure elements, and the greatest occurring for two-phase regions. Amorphous-to-crystalline transformation temperatures were found to be significantly below values reported for 3d transition metals in the case of pure elements. In the center of two-phase regions, the transformation temperatures approached 0.3 Tm, in agreement with values reported for nontransition alloys in two-phase regions.

Author (NSA)

N72-24591# Georgia Inst. of Tech., Atlanta. School of Chemical Engineering.

STUDY OF THE STRUCTURE AND MECHANICAL PROPERTIES OF ORDERED ALLOYS Progress Report, 1 Jan. - 15 Dec. 1971

B. G. LeFevre and E. A. Starke, Jr. 15 Dec. 1971 50 p refs

(Contract AT(40-1)-3908)

(ORO-3908-3) Avail: NTIS

Studies were conducted on the ordering transformation and some related mechanical properties in Ni4Mo and CuPt. In the case of Ni4Mo, X-ray line broadening measurements were extended to kinetic studies at 650 C to supplement X-ray and transmission electron microscopy data. A model for ordering kinetics was developed which permits determination of activation energies. Internal friction studies indicated that order strengthening is due primarily to interface dislocations at rotational domain boundaries. The 3D diffuse scattering associated with short-range order in Ni4Mo was measured and is being analyzed for size effect and thermal diffuse scattering. Studies on the order transformation in CuPt were conducted using microhardness, metallography, electron microscopy, and X-ray diffraction. The transformation was found to be discontinuous at intermediate and low temperatures with a grain boundary component of higher order replacing a homogeneously nucleated fine domain structure. Electron microscopy studies of lightly deformed CuPt in the fully ordered condition indicated that some twinning occurs in addition to slip. Author (NSA)

N72-24592# State Univ. of New York, Stony Brook.

SLIP INITIATION AND MICRODYNAMICS OF PLASTIC FLOW Progress Report, 1 Jan. - 31 Dec. 1971

J. C. Bilello 31 Dec. 1971 26 p refs

(Contract AT(11-1)-3476)

(COO-3476-1) Avail: NTIS

Several metals and alloys were studied to correlate their defect structure, at a microscopic level, with the observed mechanical behavior of such materials. Emphasis was placed on the slip limitations at low temperatures for tungsten and on the role of alloying in the strengthening of copper base systems. Results are included on microdynamics of W flow, properties of W polycrystals, effects of interstitials on dislocations and mechanical properties of W, and behavior of dislocations in Cu-base solid solutions. NSA

N72-24593# Los Alamos Scientific Lab., N.Mex.

LOW-TEMPERATURE EQUATION OF STATE FOR METALS

A. L. Merts and N. H. Magee, Jr. 1971 11 p refs Presented at Underground Nucl. Test Meas. Symp., Albuquerque, N. Mex., 7 Dec. 1971 Sponsored by AEC

(LA-DC-13178; Conf-711208-2) Avail: NTIS

Development of methods to provide more accurate equation of state results for pure metals in the melt-vapor region is reported. A code is described which can be used to calculate first-order phase transition from liquid to vapor state. The code cannot be correctly used for second order phase transitions, such as crystal lattice rearrangements, which alter the equations of state of the element. NSA

N72-24594# Los Alamos Scientific Lab., N.Mex.
SOME MECHANICAL AND PHYSICAL PROPERTIES OF HEAT-TREATED ALLOYS OF URANIUM WITH SMALL ADDITIONS OF Ti OR Mo
D. J. Sandstrom Dec. 1971 6 p refs
(Contract W-7405-eng-36)
(LA-4781) Avail: NTIS

Alloys of uranium with small a 1.5 wt % additions of titanium investigated. These alloys were prepared from castings worked, either by hot rolling or hot extrusion, to yield a wrought structure. The alloys were heat treated by quenching in water from the gamma region of the phase diagram to yield solution heat-treated alloys. The as-quenched material is significantly ductile and strong. After quenching, samples subjected to artificial aging treatments seem to undergo an age-hardening reaction. A 30 to 50% increase in yield strength and increased ductility can be measured in samples that were aged at 400 C for 2 hr. These materials do not appear susceptible to stress corrosion cracking in environments of 100% relative humidity. Their general corrosion resistance is superior to that of unalloyed uranium. Author (NSA)

N72-24595# Oak Ridge National Lab., Tenn.
RADIATION DAMAGE TO REFRACTORY METALS AS RELATED TO THERMIONIC APPLICATIONS
F. W. Wiffen Feb. 1972 29 p refs Presented at IEEE Thermionics Conversion Specialist Conf., San Diego, Calif., 4-7 Oct. 1971
(Contract W-7405-eng-26)
(ORNL-TM-3629; Conf-711038-2) Avail: NTIS

The effects of fast neutron irradiation on the body centered cubic refractory metals are reviewed, with emphasis on materials and conditions typical of thermionic applications in space power systems. Changes produced in the microstructure are characterized as a function of irradiation temperature. The effects of fluence, alloying, and purity are examined for available data. Swelling and changes in the mechanical and electrical properties produced by neutron irradiation are briefly reviewed. The major effects expected were in the collector and the cooler portions of the emitter in a thermionic diode, where swelling, electrical resistivity increases, and ductility losses were anticipated during reactor operation. Author (NSA)

N72-24596# Cornell Univ., Ithaca, N.Y. Materials Science Center.
SPIN-FLIP SCATTERING OF ALUMINUM CONDUCTION ELECTRONS FROM TRANSITION METAL IMPURITIES Ph.D. Thesis
Martin Albert Huisjen Sep. 1971 54 p refs
(Contract AT(30-1)-2150)
(NYO-2150-78) Avail: NTIS

The interaction of aluminum conduction electrons with transition metal inpurities was studied using the technique of transmission electron spin resonance, the transverse spin relaxation rate, T sub 2, was determined. When a transition metal impurity is added to aluminum, it contributes to 1 T sub 2. The spin-flip cross section of an impurity was found from the increase of 1 T sub 2 as a function of impurity concentration. The cross sections of V, Cr, Mn and Fe were determined. They vary by about an order of magnitude with the maximum cross section occurring at Mn. Using the Anderson model of localized magnetic states, the cross sections can be related to the local d-state spin-orbit interaction experienced by conduction band states which are admixed into the local d-state. Quantitative agreement with the data was obtained by assigning to the virtual level a width of about 1 eV. Author

N72-24597# National Aerospace Lab., Amsterdam (Netherlands).
CORRELATIONS INVOLVING PROPERTIES AND MICROSTRUCTURES OF ALUMINUM-ZINC-MAGNESIUM ALLOY FORGINGS OF THE 7079 TYPE
H. P. vanLeeuwen, W. J. VanDerVet, and L. Schra Oct. 1970 63 p refs Sponsored by Neth. Aircraft Develop. Board
(NLR-TR-70105-U) Avail: NTIS HC $5.25

The effects of different heat treatment variations on the mechanical properties and microstructure of the Al-Zn-Mg alloy, type 7079, were investigated. An attempt was made to correlate these effects with characteristic dimensions of the microstructure, suvh as the size of the matrix precipitate, size of the grain-boundary precipitate, width of the grain-boundary etc. Correlation diagrams show that fracture toughness and fatigue crack propagation resistance are closely related properties, while stress corrosion endurance is a crack tolerance property with different characteristics. Correlations between microstructure geometry and properties were relatively close when the property involved was a purely mechanical one. In case of stress corrosion endurance, where chemical aspects are involved, the correlations are less clear. In all cases, correlations with the size of the matrix precipitate were better than those with other microstructure dimensions. Author (ESRO)

N72-24598# Naval Ship Research and Development Center, Washington, D.C.
EFFECTS OF MICROSTRUCTURE, COMPOSITION, AND STRENGTH ON THE NIL DUCTILITY TRANSITION (NDT) TEMPERATURE OF HY-80 STEEL Final Report
Marcel L. Salive Jan. 1972 119 p refs
(SF35422212)
(AD-737640; NSRDC-3722) Avail: NTIS CSCL 11/6

Steel from 22 heats of low-carbon Ni-Cr-Mo steel, HY-80 (ASTM A543065, and MIL-S-16216G (Ships)) was heat treated to study the effects on the drop weight nil ductility transition (NDT) temperature of (1) commercial variation in composition and inclusion content, (2) variation in microstructure such as prior austenitic grain size and the relative amount of isothermally produced ferrite or bainite in a tempered martensitic matrix, and (3) the observed variation in strength obtained after a one-hour 1150 F temper followed by water quench to prevent embrittlement while cooling from the tempering temperature. Author (GRA)

N72-24599# Naval Research Lab., Washington, D.C. Ocean Technology Div.
CORROSION-AND-CREEP-INDUCED INSTABILITY MODELING OF FATIGUE-CRACKING IN VARIOUS ALLOYS Interim Report
Joseph M. Krafft, Curtis L. Lamb, and Kirth E. Simmonds Feb. 1972 45 p refs
(AD-737630; NRL-MR-2399) Avail: NTIS CSCL 11/6

Crack propagation, the terminal phase in many mechanical-strength failures, is often deleteriously accelerated by environmental corrosion effects. Data to characterize such effects is costly to obtain, particularly if the thresholds of fatigue and corrosion sensitivities are to be defined. Accurate predictive models are needed to extend the available data base and thus its utility in corrosion engineering. The model attempt ascribes the crack growth to the necessity to maintain a state of tensile stability at the crack tip. Discretely sized crack-tip micro-ligamants are assumed to control; they are strained by the loading of the crack. When the loading ceases, their stability is upset by creep stress relaxation and by surface corrosion. It is restored to equilibrium by an increment of extra straining which requires crack growth. Stress corrosion and fatigue crack propagation data on some 13 alloys has been culled from the literature and uniaxial and cyclic flow properties measured for each.
Author (GRA)

N72-24600# Birmingham Univ. (England). Dept. of Physical Metallurgy and Science of Materials.
THERMODYNAMICS OF ALLOYS. SOLID ELECTROLYTE STUDIES AND DIFFERENTIAL SCANNING COLORIMETRY OF PALLADIUM INDIUM ALLOYS Final Technical Report, 1 Jan. - 31 Dec. 1971
J. N. Pratt, J. M. Bird, and A. W. Bryant Jan. 1972 38 p refs
(Contract DAJA37-71-C-2507; DA Proj. 2O0-61102-B-32D)
(AD-737718; ARDG(E)-E-1385) Avail: NTIS CSCL 11/6

Reversible galvanic cells employing zirconia-calcia solid electrolytes have been used to measure thermodynamic activities and free energies of formation of palladium-indium alloys at temperatures between 750K and 1170K. Values obtained have been combined with previous calorimetric data including enthalpy of formation measurements to yield entropies of formation for palladium-rich f.c.c. solid solution and for the intermediate phase Pd3In, Pd2In, Pd5In3, PdIn, Pd2In3, and PdIn3. An analysis of the entropies into configurational, electronic, vibrational and magnetic contributions is suggested. Differential scanning calorimetry has been employed to investigate the existence of order in Pd3In and the effect of plastic deformation on the structure of this phase. A comparison is made of DeBye temperatures of the phases estimated independently from the entropy and the specific heat data. Author (GRA)

N72-24601# Battelle Memorial Inst., Columbus, Ohio. Metals and Ceramics Information Center.
CRACK BEHAVIOR IN D6AC STEEL: AN EVALUATION OF FRACTURE MECHANICS DATA FOR THE F-111 AIRCRAFT
C. E. Feddersen, D. P. Moon, and W. S. Hyler Jan. 1972 201 p refs Sponsored by the AF
(AD-737779; MCIC-72-04) Avail: NTIS CSCL 11/6

A multilaboratory experimental program was conducted to determine the fracture toughness, fatigue-crack propagation, and sustained-load crack behavior of the D6AC steel plate and forging materials used in the F-111 aircraft. The purpose of this effort was to assess crack behavior in D6AC steel in accordance with the principles of elastic fracture mechanics, such that adequate information would be available to predict the structural inspection intervals required for the F-111 aircraft.
Author (GRA)

N72-24602# Battelle Memorial Inst., Columbus, Ohio.
LOCAL YIELDING ATTENDING FATIGUE CRACK GROWTH Final Technical Report, 15 Jun. 1970 - 15 Sep. 1971
G. T. Hahn, R. G. Hoagland, and A. R. Rosenfield Nov. 1971 55 p refs
(Contract F33615-70-C-1630; AF Proj. 7021)
(AD-737791; ARL-71-0234) Avail: NTIS CSCL 11/6

Fatigue crack growth rate measurements were performed at 100C on an Fe-3Si steel in three thickness conditions and at different Delta K-levels. The test pieces were subsequently sectioned and etched to reveal the plastic deformation attending crack growth both on the surface and in the interior. Unlike preceding studies, the Fe-3Si steel displayed classical cyclic crack growth: well-defined fatigue striations with a spacing close to the per-cycle growth rate, and essentially the same growth rates that have been reported for low and medium strength steels. A highly strained region, about 1/5 the size of the monotonic plastic zone, is identified as the cyclic plastic zone. Author (GRA)

N72-24603# Naval Research Lab., Washington, D.C.
FRACTURE SAFE DESIGN OF ALUMINUM AND TITANIUM ALLOY STRUCTURES Special Summary Report
R. J. Goode and R. W. Judy, Jr. 14 Feb. 1972 35 p refs
(RR0220146)
(AD-738425; NRL-7281) Avail: NTIS CSCL 11/6

The fracture resistance characterization information obtained from the Dynamic Tear and K sub Ic test methods for high- and ultrahigh-strength aluminum and titanium alloys is summarized. These tests have been used to establish the fracture resistance characterizations for these materials covering a wide range of yield strength and metallurgical conditions. Ratio Analysis Diagram procedures have been evolved for translating this information into structural mechanics predictions for fracture. The general physical metallurgical characteristics for the generic families of these materials are discussed in relation to their potentials for optimizing aluminum and titanium alloys to high levels of fracture resistance. Author (GRA)

N72-24604# Naval Research Lab., Washington, D.C.
CRACK GROWTH RESISTANCE CHARACTERISTICS OF HIGH STRENGTH SHEET ALLOYS Final Report
C. N. Freed, A. M. Sullivan, and J. Stoop 31 Jan. 1972 23 p refs
(RR0220146)
(AD-738424; NRL-7374) Avail: NTIS CSCL 11/6

Crack propagation in a metal sheet is impeded by the inherent resistance to fracture of the alloy. This resistance is manifested by the requirement that crack growth will occur only under a rising load up to an instability load at which unstable fracture commences. If the fracture resistance curve which designates the load-crack extension relationship to instability has a unique shape for each material and is independent of most specimen dimensions, it can be a valuable tool in failure-safe design. The fracture resistance curves (R-curves) have been obtained for six high-strength sheet alloys which fractured under elastic loads. The influence of three specimen geometric variables and yield strength on the shape of the R-curve and the critical stress-intensity factor K sub c was investigated. On several alloys a comparison was made between the R-curve and K sub c value generated with a center-cracked tension (CCT) specimen and data derived from a crack-line loaded (CLL) specimen used at Armco Steel Corporation. Author (GRA)

N72-24605# Army Materials and Mechanics Research Center, Watertown, Mass.
ULTRAFINE GRAIN SIZE EFFECTS ON CORROSION BEHAVIOR
C. V. Zabielski and Milton Levy Sep. 1971 30 p refs
(DA Proj. 1T0-2105-A-328)
(AD-737587; AMMRC-TR-71-35) Avail: NTIS CSCL 11/6

The corrosion behavior of copper alloy (1.0 Cr -0.10 Cb - 0.075 Ti) in grain size range (1.45 to 12.3 micrometers) and 1010 carbon steel (1.0Cb - 0.60 Mn) in grain size range (0.92 to 77.0 micrometers) has been investigated by means of anodic polarization measurements. Based on the anodic polarization measurements, a model is proposed which relates grain size to the critical current density/grain boundary length in one square centimeter. The model indicates that as grain size increases the apparent grain boundary current will increase and suggests finer grain size alloys will be more corrosion resistant and have longer periods of crack incubation. Selected metallographic studies and potential-time measurements were made. Author (GRA)

18 MATERIALS, NONMETALLIC

Includes corrosion; physical and mechanical properties of materials (e.g., plastics); and elastomers, hydraulic fluids, etc. For basic research see: 06 Chemistry. For related information see also: 17 Materials, Metallic; 27 Propellants; and 32 Structural Mechanics.

N72-24606*# IIT Research Inst., Chicago, Ill.
DEVELOPMENT OF SPACE STABLE THERMAL CONTROL COATINGS FOR USE ON LARGE SPACE VEHICLES Triannual Report, 1 Sep. - 31 Dec. 1971
J. E. Gilligan, R. F. Boutin, R. M. Leas, and N. A. Ashford 31 Dec. 1971 72 p refs
(Contract NAS8-26791)
(NASA-CR-123629; IITRI-C6233-12) Avail: NTIS HC $5.75

CSCL 11C

The evaluation and environmental testing of zinc orthotitanate pigments for use as space stable thermal control coatings on large space vehicles are discussed. Electron paramagnetic resonance spectra of the pigments and their precursor compounds are examined. A continuing study of the spectral intensity of mercury-argon and mercury-xenon sources in reported. Results of long term environmental testing of commercially available, strippable, protective coatings are discussed. Author

N72-24607# Chemical Lab. RVO-TNO, Rijswikj (Netherlands).
ELECTRIC FILTERS. 4: THE USE OF THIN FILAMENTS [ELEKTREET FILTERS 4. HET GEBRUIK VAN DUNNE VEZELS]
R. M. Lie Aug. 1971 20 p refs In DUTCH; ENGLISH summary
(CL-1971-20; TDCK-58922) Avail: NTIS HC $3.00

The influence of the fiber diameter on the filtration properties of polymer fiber filters was investigated. The electret effect was tried to obtain a favorable penetration-loading characteristic with a low pressure drop. For large diameter fiber the penetration-loading characteraretics are not completely favorable. For small diameter fibers very small electret effects were found. This is caused by the dominating role of the mechanical interception of these filters. The increase in pressure drop with decreasing fiber diameter appeared to be very high. As a result small diameter fiber filters are likely only to be used as a mechanical interception filter. Using mixtures of small and large diameter fiber it was found that the addition of small quantities of polystrene fibers to polyethyleneterephtalate fiber results in filters with an increased mechanical strength. Author

N72-24608# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF THE INFLUENCE OF OXIDATION RESISTANT COATINGS ON THE FATIGUE STRENGTH OF HEAT RESISTANT ALLOY
I. I. Ishchenko, V. I. Omelchenko, B. N. Sinayskiy, A. D. Pogrebnyak, P. S. Banas, and M. I. Reznik 12 May 1972 11 p refs Transl. into ENGLISH from Prob. Prochnosti (USSR), no. 10, 1971 p 76-81
(JPRS-55972) Avail: NTIS HC $3.00

Data are presented on the influence of certain types of oxidation-resistant coatings on the fatigue strength of the nickel-based alloy ZhS6K, which is extensively used for vanes of aviation turbine engines. It is concluded that oxidation-resistant coatings (powder calorizing, calorizing, and aluminozirconizing with paint) had no influence on the fatigue strength of ZhS6K specimens not subjected to preliminary heating, and that the coatings increase the fatigue strength of the alloy when subjected to preliminary soaking at 950 degrees C for 1,000 hours. It is shown that the types of coatings investigated provide an increase in the fatigue strength of specimens after preliminary soaking at high temperature over unprotected specimens.
Author

N72-24609# Research Inst. of National Defence, Stockholm (Sweden).
PLASTICS ON FIRE: CORROSION
Per Atterby Feb. 1972 9 p refs Presented at the Loss Prevention Conf., Vaexjoe, Sweden, 27-29 Sep. 1971; sponsored by the Insurance Comm. of the Intern. Cooperative Alliance Its FOA Reports, Vol. 6, no. 5, 1972
(FOA-1-B-1202-G1; ISBN-91-7056-011-0) Avail: NTIS HC $3.00

The corrosion of industrial metals, concrete, and electronic equipment by PVC during fires is discussed. The corrosion is caused by the decomposition of PVC when exposed to fire; it does not burn. During decomposition hydrogen chloride is formed; together with air humidity, the hydrogen chloride forms hydrochloric acid. This acid causes most of the damage suffered by industrial plants. The costs of such corrosion and methods for reducing it are examined. E.H.W.

N72-24610# Weapons Research Establishment, Salisbury (Australia).
MULTILAYER ANTIREFLECTION COATINGS
J. Ward Feb. 1972 30 p refs
(WRE-TN-OSD-103) Avail: NTIS HC $3.50

In multielement optical systems, transmission losses and veiling glare, each the result of unwanted surface reflections, often reach significant proportions and degrade system performance. The multilayer coating of glass surfaces increases both the brightness and contrast of the transmitted image by reducing internal light scattering and increasing the transfer of energy at each air-glass interface. The suppression of ghost images and unwanted reflections is particularly important in optical instruments used for military applications. Techniques already in use at WRE are described for coating of optical surfaces so that they are hard, durable, optically efficient and highly transmitting over a wide wavelength range. Author

N72-24611# Aeronautical Research Inst. of Sweden, Stockholm.
SILICONE RUBBER MOULDING AT LOW TEMPERATURES
Goeran Lundstroem 1972 5 p
(Memo-82) Avail: NTIS HC $3.00

Transparent replicas of ice structures and coatings were made with molding compounds of epoxy and silicone rubbers. Parts of an ice covered airplane wing were molded at the scene of an air crash and later reproduced. This provides a means of testing the actual wing profile in a wind tunnel. K.P.D.

N72-24612# National Defense Research Organization TNO Rijswijk (Netherlands).
THE FOLDING ENDURANCE OF SOME PLASTIC FILMS
P. Th. vanRaaij Sep. 1971 12 p refs In DUTCH; ENGLISH summary
(CL-1971-27; TDCK-59021) Avail: NTIS HC $3.00

Fatigue tests were carried out at room temperature and at -15 C for the assessment of the folding endurance of plastic films intended for the manufacture of impermeable protective clothing. The maximum number of compressions to which the test specimens could be subjected without the penetration time of mustard gas dropping below a definite value, was regarded as a measure for the fatigue resistance. The best test results were obtained for a trilaminate consisting of a Tedlar polyvinyl fluoride film (0,0254 mm thick) extrusion-laminated on both sides to a polyethylene film. Fatigue resistance of the test materials at -15 C was considerably lower than that at room temperature.
Author

N72-24613# Gillette Research Inst., Inc., Rockville, Md.
STUDIES OF SOIL/AIRCRAFT SURFACE/CLEANER INTERACTIONS TO PROVIDE A BASIS FOR IMPROVED CLEANER TESTING Final Report, 13 Jan. 1971 - 12 Jan. 1972
Roy H. Kissinger and Charles A. Rader 20 Jan. 1972 30 p refs
(Contract N00019-71-C-0228)
(AD-736971) Avail: NTIS CSCL 11/11

The tasks of the program have been to establish the surface characteristics of aircraft painted with polyurethane paint conforming to Military Specification MIL-C-81773, to relate these surface characteristics to soil retention, to provide a well-characterized model soil, and to establish the necessary parameters for developing a laboratory test for cleaner formulations. Author (GRA)

N72-24614# Singer Co., Little Falls, N.J. Research Center.
TIME DEPENDENT PROPERTIES OF ADHESIVES Final Report, 9 Sep. 1969 - 9 Oct. 1970
Harold K. Shen and John L. Rutherford 1 Nov. 1971 112 p refs
(Contract N00156-70-C-1246)
(AD-736972; KD-71-23) Avail: NTIS CSCL 11/1

The purpose of the program was to determine the effect of

strain rate-related phenomena on the mechanical properties of typical structural adhesives. High sensitivity extensometers were used to measure the modulus, precision elastic limit, microyield stress and viscoelastic flow for metal/metal adhesive-bonded joints. Four adhesives, Metalbond 329, 328, 250 and 227, were tested in tensile and shear loading as a function of temperature, strain rate, load cycling, prior strain and recovery time." Author (GRA)

N72-24615# Manchester Coll. of Science and Technology (England).
RESEARCH ON ENERGY ABSORPTION BY NONWOVEN FABRICS Final Technical Report, Oct. 1970 - Sep. 1971
J. W. S. Hearle and A. T. Purdy Nov. 1971 46 p refs
(DA Proj. 1J6-62708-D-504)
(AD-737725) Avail: NTIS CSCL 11/5

The object of the work has been to gain a greater understanding of the means by which needled fabric absorbs energy when struck transversely by a projectile. Needle punched fabric has been subjected to a slow speed penetration test using a rigid steel probe, and to impact with a free flying projectile. The first method of test helped establish the mechanism by whivh this material deforms during impact. During high speed tests deformation was studied using high speed cine photography and various phenomena observed. Detailed observation of fabric behaviour around the impact point when multilayer samples are in use has been carried out using an embedding and sectioning technique. Projectiles extend fabric until thickness is reduced and no further resistance is offered. Author (GRA)

N72-24616# Hughes Aircraft Co., Culver City, Calif.
DEVELOPMENT OF COMPOSITE CONSTRUCTIONS WITH IMPROVED RAIN EROSION RESISTANCE Final Summary Report, 1 Apr. 1970 - 1 Nov. 1971
Boyce G. Kimmel Dec. 1971 72 p ref
(Contracts N00019-71-C-0167)
(AD-738079; HAC-P71-443) Avail: NTIS CSCL 11/9

The report describes the continued investigation of end-oriented, fiber-reinforced plastic composites as rain erosion resistant materials. The studies included the effect on rain erosion resistance as determined by whirling arm tests of such variables as matrix, reinforcement, reinforcement configuration, composition, impact angle and fiber angle with respect to the specimen surface. Matrices evaluated included rigid epoxies, flexiblized epoxies, polyurethanes, polyphenylene oxide, polybutadiene, and polyimide. Reinforcements included ECG glass roving, SCG glass roving, Nomex 1200 denier yarn and Dacron 1100 denier yarn. Author (GRA)

N72-24617# Dayton Univ. Research Inst., Ohio.
INVESTIGATION OF COMPOSITE COATING SYSTEMS FOR RAIN-EROSION PROTECTION Final Report, 5 Nov. 1970 - 5 Nov. 1971
Olive G. Engel and Andrew J. Piekutowski Nov. 1971 132 p refs
(Contract N00019-71-C-0108)
(AD-737661; UDRI-TR-71-47) Avail: NTIS CSCL 11/3

An investigation of composite coatings that consist of a soft polyurethane overcoated with a hard polyurethane was made to determine the resistance of the coating to high-speed waterdrop impingement, the pressure felt through the coating as a consequence of a 'standard' impact, and the resilience of the coating. Author (GRA)

N72-24618# Olin Mathieson Chemical Corp., New Haven, Conn. Chemicals Group.
STRUCTURE-PROPERTY STUDY OF RAIN EROSION RESISTANT POLYURETHANE COATINGS Final Report, 23 Oct. 1970 - 22 Oct. 1971
Maurice A. Raymond 15 Dec. 1971 80 p refs
(Contract N00019-71-C-0092)
(AD-737624) Avail: NTIS CSCL 11/3

A study was conducted on urethane elastomers in an attempt to define how chemical and structural features of the elastomer contribute to good rain erosion properties for aircraft radome coatings. In the first part of the program five correlations were developed between easily measured physical properties and rain erosion resistance as determined on a whirling arm rig. In the second part of the program thirty-three urethane elastomers were prepared in an experiment designed to study six chemical and structural properties. Author (GRA)

N72-24619# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
ELASTIC AND PLASTIC INTERLAMINAR SHEAR DEFORMATION IN LAMINATED COMPOSITES UNDER GENERALIZED PLANE STRESS
A. Levy, H. Armen, and J. Whiteside Feb. 1972 43 p refs Presented at the Air Force Conf. on Matrix Methods in Structural Mech., Wright-Patterson AFB, Ohio, 19-21 Oct. 1971
(Contract F33615-70-C-1308)
(AD-737508; RM-535J) Avail: NTIS CSCL 11/4

A finite-element method is employed to investigate the elastic and plastic interlaminar shear deformation in a laminated fibrous composite. A composite element, constructed of orthotropic membranes separated by shear-resisting media, is developed. The effect of interlaminar shear deformation at the free edges of solid laminates and laminates containing a cutout is presented. Author (GRA)

N72-24620# Naval Ordnance Lab., White Oak, Md.
BULK MODULES OF POLYETHYLENE OXIDE Technical Report, Jun. 1970 - Jun. 1971
R. W. Warfield 25 Jan. 1972 26 p refs
(AD-737995; NOLTR-71-208) Avail: NTIS CSCL 11/9

A compressibility pressure-temperature cycle has been developed for polyethylene oxide (PEO) by which both the melting and freezing points of this polymer are easily determined. It was found that PEO supercools about 10C and that the pressure dependencies of the melting and freezing points are approximately the same. Using the pressure dependence of the bulk modulus for PEO, the Gruneisen constant, gamma, was calculated to be about 5 and was found to have an anomalous temperature dependence. It is shown that the Anderson-Gruneisen constant, delta, and the Rao constant, n, are essentially the same parameter and that Wada's Rule holds for transitions in which the volume does not change. Author (GRA)

19 MATHEMATICS

Includes calculation methods and theory; and numerical analysis. For applications see specific categories. For related information see also: 08 Computers.

N72-24621 Stanford Univ., Calif.
THE HOMICIDAL CHAUFFEUR: A DIFFERENTIAL GAME Ph.D. Thesis
Antony Willits Merz 1971 113 p
Avail: Univ. Microfilms Order No. 71-23539

The differential game problem of the homicidal chauffeur is described in terms of minimax technique. The solution to the problem consists in finding the optimizing strategies of both players as functions of the evader's position relative to the pursuer. The strategies are specified in terms of the local position variables and the local components of the gradient in the optimal time-to-go, values of which are known at the termination of the game. The retrogressive solution is made difficult by the presence of certain exceptional lines in the relative space, which border the various regular regions in the relative space, in each of these regions the optimal paths take a specific form. The exceptional lines themselves may or may not be trajectories, and they are often characterized by discontinuities

in the gradient vector and in one or both of the controls. Each type of exceptional line (e.g., focal line, evader's dispersal line, etc.) occurs only for parameters in certain regions of the parameter space. More than twenty such regions exist. The results obtained are believed to provide a complete solution to the game for all combinations of the two parameters.
Dissert. Abstr.

N72-24622# National Defence Research Organization TNO, Soesterberg (Netherlands). Inst. for Perception.
ON THE MEASUREMENT OF THE SUBJECTIVE SAMPLING DISTRIBUTION
W. A. Wagenaar 1971 12 p refs
(IZF-1971-21; TDCK-58396) Avail: NTIS HC $3.00

Subjective sampling distributions were measured in order to account for the conservatism effect in the revision of the opinion paradigm. Two different types of subjective sampling distributions should be hypothesized in order to account for both servatism and gambler fallacy. It is shown that too flat and too peaked subjective sampling distributions may be obtained, dependent on the experimental procedure. It is concluded that explanations in terms of subjective sampling distributions are arbitrary as long as there is no indication which procedure is most appropriate for the measurement of these distributions. Author

N72-24623# National Defense Research Organization TNO, The Hague (Netherlands). Physics Lab.
ALLOCATING OPTIMUM TIME FOR SYSTEMS MALFUNCTION SEARCH
G. Konstantis and F. J. deBoer May 1971 23 p
(PHL-1971-21; TDCK-58800) Avail: NTIS HC $3.25

A study was made to determine the optimal time which should be made available to a repairman for searching further possible system malfunctions when a repair of an obvious failure has been accomplished. It is assumed that there is a probability p sub o that the system will return to its operational status after the repair and that there is a probability p sub n (n = 1,2.....) of exactly n further malfunctions. The optimal time is determined by minimizing the total time losses due to an assumed penalty time delay for repair when malfunction exists and is not detected and the available time which is lost when malfunction does not exist.
Author

N72-24624# University of Southern Calif., Los Angeles. Dept. of Electrical Engineering.
INVARIANT IMBEDDING AND THE RESOLVENT OF FREDHOLM INTEGRAL EQUATIONS WITH SEMI-DEGENERATE KERNALS
R. Bellman and S. Ueno Apr. 1972 14 p refs
(Contract AT(40-3)-113; Grant NSF GP-29049)
(USC-113P19-20; TR-72-19) Avail: NTIS HC $3.00

It is shown that Fredholm integral equations with semidegenerate kernels can be reduced to initial value problems for systems of ordinary differential equations using a formula for the Fredholm resolvent. This procedure facilitates the computational solution of the two-point boundary value problem by both analog and digital computers. Author

N72-24625*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
PROCEDURE FOR ESTIMATING STABILITY AND CONTROL PARAMETERS FROM FLIGHT TEST DATA BY USING MAXIMUM LIKELIHOOD METHODS EMPLOYING A REAL-TIME DIGITAL SYSTEM
Randall D. Grove, Roland L. Bowles, and Stanley C. Mayhew (Electronic Associates, Inc.) Washington May 1972 57 p refs
(NASA-TN-D-6735; L-8178) Avail: NTIS HC $3.00 CSCL 12A

A maximum likelihood parameter estimation procedure and program were developed for the extraction of the stability and control derivatives of aircraft from flight test data. Nonlinear six-degree-of-freedom equations describing aircraft dynamics were used to derive sensitivity equations for quasilinearization. The maximum likelihood function with quasilinearization was used to derive the parameter change equations, the covariance matrices for the parameters and measurement noise, and the performance index function. The maximum likelihood estimator was mechanized into an iterative estimation procedure utilizing a real time digital computer and graphic display system. This program was developed for 8 measured state variables and 40 parameters. Test cases were conducted with simulated data for validation of the estimation procedure and program. The program was applied to a V/STOL tilt wing aircraft, a military fighter airplane, and a light single engine airplane. The particular nonlinear equations of motion, derivation of the sensitivity equations, addition of accelerations into the algorithm, operational features of the real time digital system, and test cases are described. Author

N72-24626# University of Southern Calif., Los Angeles.
MATHEMATICS AND THE FIELD OF HISTORY
Richard Bellman Feb. 1972 9 p refs
(TR-72-10) Avail: NTIS HC $3.00

The classical use of mathematics is considered, and general application to various fields of science is discussed. The basic abilities of the computer, the roles of chance effects and complexity, and simulation in the decision making process are reviewed. K.P.D.

N72-24627# University of Southern Calif., Los Angeles. Dept. of Electrical Engineering.
ON THE MATRIX RICCATI EQUATION OF TRANSPORT PROCESSES
R. Bellman, S. Ueno, and R. Vasudevan Mar. 1972 17 p refs
(Contract AT(40-3)-113; Grant NSF GP-29049)
(USC-113P19-19; TR-72-13) Avail: NTIS HC $3.00

By keeping count of the number of interactions, perturbation expansions were obtained for the Riccati equation. Reflection and transmission matrices are presented. The wave imbedding equation, auxiliary equations, and the Liapunov equation are discussed. The case of internal flux is also considered.
K.P.D.

N72-24628# University of Southern Calif., Los Angeles. Dept. of Electrical Engineering.
PERTURBATION OF NONLINEAR POTENTIAL PROBLEMS
Edward Angel Mar. 1972 12 p refs
(Contract AT(40-3)-113; Grant NSF GP-29049)
(USC-113P19-18) Avail: NTIS HC $3.00

Invariant imbedding can be viewed as a nonclassical perturbation technique which converts nonlinear boundary value problems to quasi-linear initial value problems. The application of these ideas to the nonlinear partial differential equations of the type arising in potential theory is investigated. Author

N72-24629# Northeastern Univ., Boston, Mass. Dept. of Physics.
A THEORY OF CURRENTS
Robert Perrin May 1972 14 p refs Sponsored in part by NSF
(NUB-2133) Avail: NTIS HC $3.00

A modification of the Sugawara model is presented in which all components of the currents have scale dimension three, all requisite Schwinger terms are present in the stress tensor commutators, and in which the trace of the stress tensor is a sum of terms of fixed scale dimension. Author

N72-24630# Joint Publications Research Service, Arlington, Va.
AUTOCORRELATION PROPERTIES OF CERTAIN TYPES OF BINARY SEQUENCES
M. I. Pelekhatyy and Ye. A. Golubev 9 May 1972 11 p refs
Transl. into ENGLISH from Probl. Peredachi Inform., Akad. Nauk SSSR (Moscow), v. 8, no. 1, 1972 p 92-98
(JPRS-55940) Avail: NTIS HC $3.00

A study was made of the autocorrelation properties of certain sequences constructed using the 2-valued character psi

of a multiplicative group of field GF (p). The study of the aperiodic autocorrelation functions of these sequences was performed by computer. It was established by comparison with known results that the sequences analyzed in most cases have the optimal aperiodic autocorrelation functions. Author

N72-24631*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE SELECTION OF APPROXIMATING FUNCTIONS FOR TABULATED NUMERICAL DATA
H. L. Ingram and W. R. Hooker 30 Jan. 1972 147 p
(NASA-TM-X-64658) Avail: NTIS HC $9.50 CSCL 12A

A computer program was developed that selects, from a list of candidate functions, the approximating functions and associated coefficients which result in the best curve fit of a given set of numerical data. The advantages of the approach used here are: (1) Multivariable approximations can be performed. (2) Flexibility with respect to the type of approximations used is available. (3) The program is designed to choose the best terms to be used in the approximation from an arbitrary list of possible terms so that little knowledge of the proper approximating form is required. (4) Recursion relations are used in determining the coefficients of the approximating functions, which reduces the computer execution time of the program. Author

N72-24632# Joint Publications Research Service, Arlington, Va.
APPLICATION OF MATHEMATICAL THEORY
9 May 1972 13 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 202, no. 5-6, 1972 p 998-1000, 1288-1291
(JPRS-55934) Avail: NTIS HC $3.00

Differential games and diagrams of threshold elements are discussed. For individual titles, see N72-24633 through N72-24634.

N72-24633# Joint Publications Research Service, Arlington, Va.
CONCERNING ONE DIFFERENTIAL GAME WITH INCOMPLETE INFORMATION
M. I. Zelikin *In its* Appl. of Mathematical Theory 9 May 1972 p 1-4 ref (See N72-24632 15-19)
Avail: NTIS HC $3.00

An analysis is presented of a game in which two objects P and E may be moved in a circle at a rate that does not exceed unity. At the initial moment of time a random uniform distribution is given for both objects on the circle. Neither knows anything about the location of the other. The player P tries to capture player E, and the game is considered ended when P and E are at the same point. Each player selects his own strategy in compliance with a given differential equation. Two lemmas are considered: (1) The probability of capture for the first period is equal to 1/2. (2) With a fixed trajectory for E, the random time of capture is uniformly distributed on the segment (0, 2 pi r).
Author

N72-24634# Joint Publications Research Service, Arlington, Va.
CONCERNING DIAGRAMS OF THRESHOLD ELEMENTS
O. B. Lupanov *In its* Appl. of Mathematical Theory 9 May 1972 p 5-11 refs (See N72-24632 15-19)
Avail: NTIS HC $3.00

Theorems and lemmas are considered which expand the concept of proving algebraic functions for determining the diagrams of threshold elements. Using the method of synthesis and the principle of local coding, the asymptotically best methods of synthesizing the diagrams for known classes of functions are obtained easily and simply. N.E.N.

N72-24635*# University of Southern Calif., Los Angeles.
LEVEL CROSSING PROBLEMS FOR RANDOM PROCESSES
Interim Technical Report
I. F. Blake (Waterloo Univ.) and W. C. Lindsey Sep. 1971 87 p refs
(Grant NGL-05-018-044; Contract N00014-67-A-0269-0022; NRC A-7382)
(AD-734004; USCEE-407; NASA-CR-126673) Avail: NTIS HC $6.50 CSCL 12/1

A state of the art survey of the techniques and results available for the level crossing problem for random processes and statistical analysis. Author

N72-24636# Research Inst. of National Defence, Stockholm (Sweden).
ON THE CALCULATION OF FOURIER INTEGRALS
Bo Einarsson Dec. 1970 22 p refs Presented at Scand. Computer Congr. NordDATA-70, Copenhagen, 26-28 Aug. 1970
(FOA-2-C-2446-11) Avail: NTIS HC $3.25

A comparison is given between the Filon formula and a spline method for calculating Fourier integrals. The comparison shows that the spline method is superior in that it gives higher accuracy for the same number of function evaluations. Author

N72-24637# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
THEORETICAL RESEARCH IN DETERMINISTIC OPTIMIZATION [RECHERCHES THEORIQUES EN OPTIMISATION DETERMINISTE]
Christian Marchal 1971 161 p refs In FRENCH; ENGLISH summary
(ONERA-P-139) Avail: NTIS HC $10.25

Analytic theories of optimization are generalized and simplified. The notion of maneuverability is substituted for the classical notion of control and two corresponding notions of admissibility are defined: one for the case in which discontinuities are not allowed, and one for the case when some discontinuities of state are allowed. Canonicity and the maximum principle are also generalized, leading to a classification of admissible trajectories and definition of the conditions for applicability. The optimality test for singular extrema is extended to the most complicated arc and sufficient conditions of optimality are defined. The results are generalized to the cases of admissibility of the discontinuous type, and the maximum principle is extended to simple cases of discontinuity of the maneuverability, or control, with respect to state and time. Author (ESRO)

N72-24638# Carnegie-Mellon Univ., Pittsburgh, Pa. Management Sciences Research Group.
BAYESIAN MODIFICATION OF THE FAILURE RATE FUNCTION
Carole A. Aldrich and Thomas E. Morton Dec. 1971 24 p refs
(AD-738041; RR-265) Avail: NTIS CSCL 12/1

The failure rate function is widely used in such theoretical frameworks as dynamic programming and control theory, reliability and redundancy, queueing and renewal theory; which have been developed for such diverse applications as modeling research and development, priority schemes for time sharing computers, demand for replacement parts, and design of space vehicles. The parameters of the function are often uncertain; furthermore, the fact of non-failure up to a point z yields information on the parameters. As Lucas has pointed out, specification of an initial prior distribution g(a) on the parameter vector a leads directly via Bayesian analysis from the original failure rate function h(z/a) to a modified failure rate function H*(z) which may then be used in the analysis as if it were deterministic. Of great interest are results about the general shape of H*(z) (increasing, decreasing, unimodal, convex, etc.) in terms of H(z/a) and g(a).
Author (GRA)

N72-24639# California Inst. of Tech., Pasadena. Dept. of Mathematics.
ANALOGUES OF A THEOREM OF SCHUR ON MATRIX TRANSFORMATIONS
H. J. Ryser 1971 15 p refs
(Contract N00014-67-A-0094-0010)
(AD-736978) Avail: NTIS CSCL 12/1

Let A and B be matrices of sizes m by t and t by n, respectively, with elements in a field F. Let x(l), ..., x(t) denote t independent indeterminates over F and define X = diag(x(l), ..., x(t)). Then AXB = Y is a matrix of size m by n such that every element of Y is a linear form in x(l), ..., x(t) over F. The present paper investigates the converse proposition.
Author (GRA)

N72-24640# Stanford Univ., Calif. Dept. of Statistics.
A NOTE ON OPTIMAL SPACINGS FOR SYSTEMATIC STATISTICS
Herman Chernoff 15 Nov. 1971 15 p refs
(Contract N00014-67-A-0112-0051)
(AD-737638; TR-70) Avail: NTIS CSCL 12/1

Let X(1), X(2),...,X(n) be the order statistics from a large sample of n independent identically distributed random variables with unknown scale and location parameters. Linear unbiased estimates of these parameters can be constructed using k order statistics, where the orders are approximately (lambda(1)n), (lambda(k)n) for specified lambda(1), lambda(2),...,lambda(k). As k approaches infinity let the number of lambda(i) in an interval be proportional to a density function f. Then one may select f to yield approximately optimal spacings (i.e., choice of lambda(i)). The study is carried out for estimating the mean of a normal distribution with known variance. Author (GRA)

N72-24641# Iowa Univ., Iowa City. Dept. of Mechanics and Hydraulics.
IMPLICIT AD HOC METHODS FOR NONLINEAR PARTIAL DIFFERENTIAL EQUATIONS
William F. Ames Feb. 1971 16 p refs
(Contract DAAF03-69-C-0014)
(AD-737716; THEMIS-UI-29) Avail: NTIS CSCL 12/1

Special methods are introduced for the solution of certain nonlinear partial differential equations used to describe wave propagation and diffusion. Implicit separation of variables is developed and applied to nonlinear wave problems. Both explicit and implicit generalized traveling wave concepts are explained and applied in fluid mechanics and diffusion. Author (GRA)

N72-24642# Naval Weapons Center, China Lake, Calif.
EXPERIMENTAL MODELLING OF NETWORK-LIKE SYSTEMS Ph.D. Thesis
Allen B. Gates Jan. 1972 138 p refs
(AD-737699; NWC-TP-5310) Avail: NTIS CSCL 12/1

Techniques for construction of mathematical models of linear, time-invariant, network-like systems are presented. The problem considered falls in the general category of the identification problem in control system theory. Noiseless measurements are assumed for development of the algorithms. The thesis covers two areas. The first area is concerned with time-domain techniques for determining the system and input matrices. First, a model adaptive algorithm is derived assuming the entire state input vector is measured. Secondly, a non-linear observer parameter estimator technique is presented for the case where a subset of states and the input vector is measured. The second area is concerned with extracting the parameter submatrices of the network-like system from the system input and system matrices. Author (GRA)

N72-24643# Illinois Univ., Urbana. Coordinated Science Lab.
A BOUNDARY LAYER METHOD FOR OPTIMAL CONTROL OF SINGULARLY PERTURBED SYSTEMS Ph.D. Thesis
Robert Reynolds Wilde Jan. 1972 128 p refs
(Contract DAAB07-67-C-0199)
(AD-737527; R547; UILU-ENG-72-2206) Avail: NTIS CSCL 12/1

A method is developed for approximating the solution of an optimally controlled singularly perturbed system. The method is applicable to both fixed and free end-point problems where in the latter problem a terminal cost is added to the performance index. Although the optimal solution is generally difficult to obtain using existing numerical algorithms, this method avoids such difficulties. The approximate solution is obtained by properly combining the solutions of three systems: a reduced 2n(1)-dimensional system, a left layer time invariant initial value n(2)-dimensional system, and a right layer time invariant initial value n(2)-dimensional system. The layer solutions can be interpreted as the results of two boundary layer regulators: one acting in forward time from the initial point and the other acting in reverse time from the end point. Example problems are worked which illustrate the method developed. Author (GRA)

N72-24644# Illinois Univ., Urbana. Coordinated Science Lab.
ALGORITHMS FOR MIN-MAX PROBLEMS IN HILBERT SPACES Ph.D. Thesis
Robert Wayne Hecht Jan. 1972 63 p refs
(Contract DAAB07-67-C-0199; Grant AF-AFOSR-1579-68)
(AD-737528; R-548; UILU-ENG-72-2207) Avail: NTIS CSCL 12/1

The problem considered is the minimization of a functional in Hilbert spaces, where the functional being considered is the maximum of a set of N functionals for each point in the Hilbert space. Two algorithms are presented. One is a gradient, or steepest-descent method. The other is a Newton-Raphson method. It is shown that the two algorithms are to be used together. The steepest-descent method is to be used first and then the Newton-Raphson method. To use the Newton-Raphson method, convexity is assumed. Both the theoretical and the numerical aspects of the algorithms are discussed. Author (GRA)

N72-24645# School of Aerospace Medicine, Brooks AFB, Tex.
AN ALGORITHM FOR CRITICAL VALUES OF THE TWO GROUP RANK DISTANCE CLASSIFICATION STATISTIC
H. M. Hughes and Richard C. McNee Dec. 1971 12 p ref
(AF Proj. 6319)
(AD-737567; SAM-TR-71-50) Avail: NTIS CSCL 12/1

The rank distance method is restated for discriminating between two groups using a single variable. A formula is derived for the probability of misclassifications in training set of n observations from each group. Knowledge of this probability permits inference as to the appropriateness of the variable for discrimination purposes. The formula is exact only for values of U below a bound which is proportional to n. A table of numerical values indicates the formula to be useful up to about n = 25 but not beyond n = 40. Author (GRA)

N72-24327# Joint Publications Research Service, Arlington, Va.
NONLINEAR DIFFERENTIAL GAME OF EVASION
V. N. Lagunov *In its* Cybernetics and Regulation Theory 18 Apr. 1972 p 18-23 refs (See N72-24322 15-10)
Avail: NTIS HC $3.25

20 METEOROLOGY

Includes climatology; weather forecasting; and visibility studies. For related information see also: 13 Geophysics; and 30 Space Sciences.

N72-24646 Freie Univ., Berlin (West Germany). Inst. fuer Meteorologiz.
METEOROLOGICAL DATA. VOLUME 109, NO. 2: NEW ASPECTS AND INTERPRETATIONS OF AIR MASSES AND FRONTS CONCEPT [METEOROLOGISCHE ABHANDLUNGEN. BAND 109, HEFT 2: NEUE ASPEKTE UND INTERPRETATIONEN ZUM LUFTMASSEN- UND FRONTENTONZEPT]
Manfred Geb 1971 142 p refs In GERMAN; ENGLISH summary
Avail: Issuing Activity

The reasons which have caused a crisis of the theory of fronts and air masses after a period of successful years and

general agreement are discussed. A new absolute classification of air masses for the northern hemisphere is presented in order to replace the well-known theory of BERGERON. A more detailed Classification is derived for those air masses being relevant for Central Europe. The main air masses are identified statistically and practical methods are given for their re-identification. The theory of fronts represented by its various modifications is criticized in a constructive manner. Special consideration is given to thermal structures of the lower troposphere. The problem of occlusion is discussed. A definition of fronts is formulated which meets the requirements for pattern simplicity as well as those for synoptic reality and practical use. In order to emphasize the importance of occlusion fronts different examples of fronto- and cyclogenetic developments connected to this frontal pattern are presented and discussed. The mutual relation between frontal structures and the conception of air masses appears to be reduced to a realistic point of view, while certain applications, generalizations and false conclusions are rejected. Author

N72-24647# Joint Publications Research Service, Arlington, Va.
CLOUD, FOG MODIFICATION
I. P. Polovina 9 May 1972 109 p Transl. into ENGLISH from the book "Vozdeystviya na Vnutrimassovyye Oblaka Sloistykh Form" Leningrad, Hydrometeorol. Publishing House, 22 Apr. 1971 215 p
(JPRS-55936) Avail: NTIS HC $7.50

The temperature threshold for the use of dry ice as a reagent for the dissipation of clouds and fog, and for causing precipitation is discussed along with the techniques for conducting tests for studying artificial crystallization of clouds. Comparisons of experimental results with theoretical studies of the crystallization process in clouds are presented, and results of fog dissipation studies are included. F.O.S.

N72-24648# National Weather Service, Silver Spring, Md.
PUBLIC FORECAST VERIFICATION SUMMARY, MAY 1970 - APRIL 1971
Robert G. Derouin and Geraldine F. Cobb Mar. 1972 93 p refs
(NOAA-TM-NWS-FCST-17) Avail: NTIS HC $6.75

Performance scores for May 1970 to April 1971 of guidance from the National Meteorological Center (NMC), State forecasts (FP's) from the Weather Service Forecast Offices (WSFO's), and local forecasts from the Weather Service Offices (WSO's) are summarized. The small improvement by succeeding echelons is evident again, and most showed better scores than previous years. The NMC had the best resolution for the second and third period precipitation forecasts. All echelons had a small bias of underforecasting temperatures for all periods. It is likely the improvement resulted, in part, from a change in the precipitation criteria in the primitive equation (PE) model, and from the new NMC objective temperature forecasts. Scores for individual stations and FP/NMC areas are provided so that local comparisons can be made in relation to the national level of like scores. Author

N72-24649# Department of Trade and Industry, Stevenage (England).
AIR POLLUTION AT HEATHROW AIRPORT, LONDON: APRIL - SEPTEMBER, 1970
J. Parker 8 Feb. 1971 43 p refs
Avail: NTIS HC $4.25

Air pollution at Heathrow Airport, London, was measured at points where urban road traffic pollution could be separated from the runway and central airport pollution for comparison of traffic and aircraft emissions. Information on maximum concentrations of pollution from aircraft on the takeoff run was gathered by measuring smoke, hydrocarbons, and oxides near the runway. The results indicate that the highest values for emissions come from road traffic and taxiing. F.O.S.

N72-24650*# Translation Consultants, Ltd., Arlington, Va.
THE METEOROLOGY OF TOMORROW
P. Morel Washington NASA Jun. 1972 31 p refs Transl. into ENGLISH from Rech. (Paris), v. 3, no. 22, Apr. 1972 p 345-358
(Contract NASw-2038)
(NASA-TT-F-14332) Avail: NTIS HC $3.75 CSCL 04B

A state of the art review is presented on meteorology. The atmosphere as a heating media, turbulent flows in atmospheric circulation, and when to measure meteorological parameters are discussed. The European meteosat project, Eole and the automatic stations, and Nimbus to ITOS satellites are reviewed, along with televised observations and stationary reconnaissance satellites. J.A.M.

N72-24651# Danish Meteorological Inst., Charlottenlund.
METEOROLOGICAL YEARBOOK, PART 1: DENMARK AND FAROE ISLANDS (EXCEPT GREENLAND), 1966
1971 198 p refs In DANISH and ENGLISH
Avail: NTIS HC $12.00

Tabulated annual, monthly, and daily meteorological data, and climatic maps of monthly mean temperatures and precipitation are presented. The data include air pressure, temperature, wind frequency and force, humidity, precipitation, and sunshine. N.E.N.

N72-24652# Institut Royal Meteorologique de Belgique, Brussels.
ATMOSPHERIC POLLUTION, SMOKE, AND SULFUR DIOXIDE Monthly Bulletin, May 1971 [POLLUTION ATMOSPHERIQUE, FUMEE ET ANHYDRIDE SULFUREUX BULLETIN MENSUEL, MAI 1971]
May 1971 28 p In FRENCH and DUTCH Prepared jointly with Inst. d'Hyg. et d'Epidemoil.
Avail: NTIS HC $3.50

Data obtained at Belgian weather stations are tabulated. The air pollution apparatus is briefly described. Author (ESRO)

N72-24653# Institut Royal Meteorologique de Belgique, Brussels.
CLIMATOLOGICAL OBSERVATIONS Monthly Bulletin, Jan. 1972 [OBSERVATIONS CLIMATOLOGIQUES BULLETIN MENSUEL, JANVIER 1972]
Jan. 1972 16 p In FRENCH and DUTCH
Avail: NTIS HC $3.00

Meteorological parameters observed at different Belgian weather stations during January 1972 are given. Author (ESRO)

N72-24654# Institut Royal Meteorologique de Belgique, Brussels.
SYNOPTIC OBSERVATIONS Monthly Bulletin, Jan. 1971 [OBSERVATIONS SYNOPTIQUES BULLETIN MENSUEL, JANVIER 1971]
1972 33 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Synoptic measurements made at different Belgian weather stations in January 1971 are presented. Author (ESRO)

N72-24655# Institut Royal Meteorologique de Belgique, Brussels.
SYNOPTIC OBSERVATIONS Monthly Bulletin, Mar. 1971 [OBSERVATIONS SYNOPTIQUES BULLETIN MENSUEL, MARS 1971]
Mar. 1972 32 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Synoptic measurements made at different Belgian weather stations in March 1971 are presented. Author (ESRO)

N72-24656# Institut Royal Meteorologique de Belgique, Brussels.
SYNOPTIC OBSERVATIONS Monthly Bulletin, Apr. 1971 [OBSERVATIONS SYNOPTIQUES BULLETIN MENSUEL, AVRIL 1971]
Apr. 1971 32 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Synoptic measurements made at different Belgian weather stations in April 1971 are presented. Author (ESRO)

N72-24657# Institut Royal Meteorologique de Belgique, Brussels.
SYNOPTIC OBSERVATIONS Monthly Bulletin, May 1971 [OBSERVATIONS SYNOPTIQUES BULLETIN MENSUEL, MAI 1971]
1972 32 p In FRENCH; and DUTCH
Avail: NTIS HC $3.75

Synoptic measurements made at different Belgian weather stations in May 1971 are presented. Author (ESRO)

N72-24658# Institut Royal Meteorologique de Belgique, Brussels.
CLIMATOLOGICAL OBSERVATIONS Monthly Bulletin, Feb. 1972 [OBSERVATIONS CLIMATOLOGIQUES BULLETIN MENSUEL, FEVRIER 1972]
Feb. 1972 16 p IN FRENCH and DUTCH
Avail: NTIS HC $3.00

Meteorological parameters observed at different Belgian weather stations during February 1972 are given.
Author (ESRO)

N72-24659# Woods Hole Oceanographic Institution, Mass.
ON THE CALCULATION OF WIND STRESS CURL OVER OPEN OCEAN AREAS FROM SYNOPTIC METEOROLOGICAL DATA WITH APPLICATION TO TIME DEPENDENT OCEAN CIRCULATION
Christopher S. Welch Feb. 1972 192 p refs
(Contracts N00014-66-C-0241; DOT-CG-10618-A; NR Proj. 083-004)
(AD-738031; WHOI-Ref-72-6) Avail: NTIS CSCL 04/2

The method used by N. P. Fofonoff for estimating wind stress curl from surface atmospheric pressure maps is developed for use with the National Meteorological Center analysis grid. A formula is developed relating the wind stress curl directly to geometrically apparent features of the surface pressure analyses. The sensitivity of the formula to small deviations in the basic pressure field is estimated. Some statistical properties of the resulting formula as applied to actual pressure analyses are investigated. In particular, the geostrophic wind estimated for two finite difference grids is compared to observed winds from an independent anemometer located at W.H.O.I. site 'D'. The formula is applied at Bermuda and the results compared to the record from the tide gauge located there. A significant relation between wind stress curl and sea level is found after tidal and inverted barometer effects are suppressed. The formula is applied to time dependent motions of the Labrador Current as evidenced by iceberg drifts for the 1959 ice season. Agreement is found between calculated and observed iceberg motions on the eastern slope of the Grand Banks using Sverdrup dynamics.
Author (GRA)

N72-24660# RAND Corp., Santa Monica, Calif.
THE SOVIET DARMS
Serge M. Olenicoff Jul. 1971 20 p refs
(AD-738073; P-4679) Avail: NTIS CSCL 04/2

The Soviets have for many years been channeling substantial amounts of effort and resources into their Arctic research program. An extensive network of weather stations operate year-round along the entire arctic coastline of the Soviet Union, and seasonal observations of ice conditions are performed by a large fleet of ice-reconnaissance aircraft, by icebreakers, by ship-based helicopters, and by satellites. In addition, since 1954, the Soviets have had at least two manned drifting stations simultaneously operating in the Arctic Basin at all times. A considerable amount of data has also been gathered by the annual High Latitude Air Expeditions that have enabled Soviet scientists to make observation-oriented landings all over the Arctic Basin, especially in the otherwise inaccessible central regions. Finally, Soviet scientists have developed and deployed Drifting Automatic Radio-Meteorological Stations (DARMS) specially designed to operate and gather data in the pack-ice environment of the Arctic Basin. Author (GRA)

N72-24661# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
OZONE AND TEMPERATURE CHANGE IN THE WINTER STRATOSPHERE
J. S. Randhawa Nov. 1971 22 p refs
(DA Proj. 1T0-61102-b-53A)
(AD-737599; ECOM-5414) Avail: NTIS CSCL 04/2

In an experiment to study the correlation between temperature and ozone in the disturbed winter atmosphere, two rocket-borne ozonesonde were flown during a time in which temperature structure in the stratosphere and lower mesosphere changed at certain altitudes from the previous day. The resulting ozone and temperature distribution as compared to distribution on the control day at the end of winter season showed variations during the time the atmosphere was disturbed. These variations may be explained by considering the temperature dependence of reaction rates for an oxygen atmosphere. Author (GRA)

N72-24662# Arctic Inst. of North America, Washington, D.C.
USING AN INDEX OF ATMOSPHERIC CIRCULATION FOR LONG RANGE FORECASTING OF RIVER BREAKUP
E. I. Savchenkova Hanover, N. H. Army Cold Regions Res. and Eng. Lab. Jan. 1972 9 p refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), v. 5, 1957 p 34-37
(Contract DACW35-68-C-0069)
(AD-737805; CRREL-TL311) Avail: NTIS CSCL 04/2

In the report the type of atmospheric circulation in a specific month, expressed by a numerical characteristic, is used for making long range forecasts of breakup of river ice in the northeastern part of the European territory of USSR.
Author (GRA)

N72-24663# Manchester Coll. of Science and Technology (England). Dept. of Physics.
THE ROLE OF ELECTRICAL FORCES IN THE DEVELOPMENT AND DISSIPATION OF CLOUDS AND FOG Final Technical Report
J. Latham and M. H. Smith Nov. 1971 72 p refs
(Contract DAJA37-71-C-117; DA Proj. 2M0-61102-B-53B)
(AD-737728) Avail: NTIS CSCL 04/2

Several lines of investigation have been pursued in the second year of the contract. These include: the coalescence efficiencies of water drops; the production of satellite droplets by colliding water drops and the resulting effect upon rainfall rate; the influence of electric forces upon the interaction of cloud droplets; the calculation of the effectiveness of various hygroscopic materials as fog modification agents. The studies of the interactions of colliding water drops are now complete and will comprise the main body of the report. The investigation of the hygroscopic material is also complete and the work on the influence of electric forces upon the interactions of cloud droplets is well under way, although the experiment is not yet completely operational. Author (GRA)

N72-24664# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 13001 HONEST JOHN LASER, MISSILE NO. 134, ROUND NO. 614 ROL (7 DECEMBER 1971) Meteorological Data Report
Dec. 1971 25 p
(DA Proj. 1T6-65702-D-127)
(AD-737577; DR-681) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 13001 Honest John Laser, Missile Number 134, Round Number 614 ROL, are presented in tabular form. Author (GRA)

N72-24665# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 03702 HONEST JOHN, MISSILE NO. 622, ROUND NO. 616 AML Meteorological Data Report for 11 January 1972
Jan. 1972 29 p

(DA Proj. 1T6-65702-D-127)
(AD-737579; DR-685) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 03702 Honest John, Missile Number 622, Round Number 616 AML, are presented in tabular form. Author (GRA)

N72-24666# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 12803 LANCE, MISSILE NO. 2108, ROUND NO. 140 SPL Meteorological Data Report
Jan. 1972 34 p
(DA Proj. 1T6-65702-D-127)
(AD-737580; DR-686) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 12803 Lance, Missile Number 2108, Round Number 140 SPL, are presented in tabular form. Author (GRA)

N72-24667# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 11601 LANCE, MISSILE NO. 2106, ROUND NO. 141 SPL Meteorological Data Report for 25 January 1972
Jan. 1972 82 p
(DA Proj. 1T6-65702-D-127)
(AD-737581; DR-687) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 11601 Lance, Missile Number 2106, Round Number 141 SPL, are presented in tabular form. Author (GRA)

N72-24668# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 12806 LANCE, MISSILE NO. 2110, ROUND NO. 142 ESL Meteorological Data Report for 28 January 1972
Jan. 1972 56 p
(DA Proj. 1T6-65702-D-12702)
(AD-737582; DR-688) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 12806 Lance, Missile Number 2110, Round Number 142 ESL, are presented in tabular form. Author (GRA)

N72-24669# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE PERTURBATION OF THE STRATOSPHERE AND ITS POSSIBLE ORIGINS
B. I. Sazonov and V. P. Zorin 30 Nov. 1971 20 p refs Transl. into ENGLISH from Tr. Arkticheskogo i Antarkt. Nauchno-Issled. Inst. (Leningrad), v. 289, 1969 p 24-35
(AD-738390; FTD-MT-24-1401-71) Avail: NTIS CSCL 04/2

On the basis of an analysis of about 15,000 high altitide meteorological maps the authors computed an index characterizing the degree of disturbance of zonal flow, the mean velocity of meridional (SIC) transfer AA particular level and at a particular latitude, as well as the number and intensity of pressure formations at a fixed latitude. The article gives the mean monthly values of this index at four stratospheric levels. GRA

N72-24670# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ABOUT THE RELATIONSHIP OF THE FLUCTUATIONS OF THE TEMPERATURE FIELD OF THE TROPOSPHERE OF THE COASTAL REGIONS OF THE BLACK SEA WITH THE GEOMAGNETIC DISTURBANCE
R. V. Smirnov 26 Nov. 1971 18 p refs Transl. into ENGLISH from Tr. Akad. Nauk Ukr. SSR, Morskyi Hidrofizychnyi Inst. (Kiev), v. 37, 1966 p 169-178
(AD-738249; FTD-MT-24-1024-71) Avail: NTIS CSCL 04/2

The study in the Black Sea coastal regions showed good correlation between fluctuations in average daily values of the tropospheric temperature field and variations in the level of geomagnetic disturbances for all occurrences of solar corpuscular activity over the period 1961-1963. This connection obtained not only for the individual geomagnetic activity maxima and minima, but continuously throughout the entire period. Thus any geomagnetic field disturbance was associated with a change in the synoptics of the coastal regions, perhaps more directly than in continental areas. It was suggested that the closer relationship observed in the spring and fall months may be associated with increased magnetic activity during the equinox. Author (GRA)

N72-24878# Joint Publications Research Service, Arlington, Va.
METEOROLOGY
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 275 9 May 1972 p 15-21 (See N72-24876 15-30)
Avail: NTIS HC $6.75

21 NAVIGATION

Includes guidance; autopilots; star and planet tracking; inertial platforms; and air traffic control. For related information see also: 07 Communications.

N72-24671*# California Univ., Los Angeles. Mechanics and Structures Dept.
ATTITUDE STABILITY OF SPINNING FLEXIBLE SPACECRAFT Final Report
Peter W. Likins and Frank J. Barbera Dec. 1971 164 p refs
(Contract NAS8-26214)
(NASA-CR-123569; UCLA-ENG-7176) Avail: NTIS HC $10.25 CSCL 22B

The stability of spinning flexible satellites in a force-free environment was analyzed. The satellite was modeled as a rigid core having attached to it a flexible appendage idealized as a collection of particles (point masses) interconnected by springs. Both Liapunov and Routh-Hurwitz stability procedures are used. In the former, the Hamiltonian of the system, constrained through the angular momentum integral so as to admit complete damping, is used as a testing function. Equations of motion are written using the hybrid coordinate formulation, which readily accepts a modal coordinate transformation ultimately allowing truncation to a level amenable to literal stability analysis. Closed form stability criteria are generated for the first mode of a restricted appendage model lying in a plane containing the system center of mass and orthogonal to the spin axis. The effects of spin on flexible bodies are discussed by considering a very elementary particle model. Control of passively unstable spacecraft is briefly considered. Author

N72-24672*# Scripps Institution of Oceanography, San Diego, Calif.
VISUAL ASPECTS OF AIR COLLISION AVOIDANCE: COMPUTER STUDIES ON PILOT WARNING INDICATOR SPECIFICATIONS Final Report
Gerald D. Edwards and James L. Harris, Sr. Feb. 1972 28 p refs
(Grant NGR-05-009-059)
(NASA-CR-126669; SIO-Ref-72-3) Avail: NTIS HC $3.50 CSCL 17G

Techniques of computer calculations used to analyze the potential for improving visual acquisition of collision threats by means of Pilot Warning Indicator systems (PWI) are described. The quantitative effects of PWI resolution and effective range upon the average cumulative probability of detection are presented. Author

N72-24673# National Aviation Facilities Experimental Center, Atlantic City, N.J.
EXPERIMENTATION SUPPORT FOR DEMONSTRATION OF AN AUTOMATIC POSITION REPORTING TECHNIQUE AT OAKLAND, CALIFORNIA Final Report, Jan. 1970 - Jul. 1971
Gerald E. Titherington, Michael J. Massimino, and James S.

Beaty Apr. 1972 68 p
(FAA-RD-71-92; FAA-NA-72-28) Avail: NTIS HC $5.50

The development of an automatic air traffic control system in which inertial navigation data position reports from commercial aircraft are combined with computer presentations is discussed. The position reports are received by VHF troposcatter antennas and relayed to a ground station. The reports are used as input to a computer-driven graphic display. The system displays the progress of the flight and makes it possible to extrapolate flight paths in the absence of data from the aircraft. Author

N72-24674# Joint Publications Research Service, Arlington, Va.
OPTICAL AND ELECTRONIC INSTRUMENTS FOR SPACECRAFT ORIENTATION AND NAVIGATION
Ya. M. Ivandikov 8 May 1972 176 p refs Transl. into ENGLISH of the book "Optiko-Elektronnyye Pribory Dlya Orientatsii i Navigatsii Kosmicheskikh Apparatov" Moscow, Publishing House of the Machine Buildirg Industry, 1971 199 p
(JPRS-55909) Avail: NTIS HC $11.00

Basic information concerning electron-optical instruments used for orientation and navigation of space vehicles is presented. The general principles of the most widely used instruments are reviewed. The instruments discussed are electron-optical local vertical plotters and instruments for orientation on the basis of the sun, planets, and stars. Practical diagrams of the instruments are presented and some theoretical questions connected with the selection and calculation of their principal elements are discussed. Author

N72-24675*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
APOLLO EXPERIENCE REPORT: DEVELOPMENT OF GUIDANCE TARGETING TECHNIQUES FOR THE COMMAND MODULE AND LAUNCH VEHICLE
Jerome D. Yencharis, Robert F. Wiley, Robert S. Davis, Quentin A. Holmes, and Kenneth T. Zeiler Washington Jun. 1972 37 p
(NASA-TN-D-6848; MSC-S-308) Avail: NTIS HC $3.00 CSCL 22B

The development of the guidance targeting techniques for the Apollo command module and launch vehicle is discussed for four types of maneuvers: (1) translunar injection, (2) translunar midcourse, (3) lunar orbit insertion, and (4) return to earth. The development of real-time targeting programs for these maneuvers and the targeting procedures represented are discussed. The material is intended to convey historically the development of the targeting techniques required to meet the defined target objectives and to illustrate the solutions to problems encountered during that development. Author

N72-24676# Research Inst. of National Defence, Stockholm (Sweden).
AN EXPERIMENTAL INVESTIGATION OF THE ACCURACY OF THE OMEGA SYSTEM IN SWEDEN
Sylve Arnzen Apr. 1972 17 p refs *Its* FOA Reports, vol. 6, no. 6, 1972
(FOA-3-B-3029-E4; ISBN-91-7056-013-7) Avail: NTIS HC $3.00

The accuracy was investigated of the Omega system carried out at a number of places (30-200 n.mi. from a reference station) along the eastern coast of Sweden during the period August-December 1969. Both the ordinary Omega and Differential Omega modes of operation were employed, using signals, when possible, from all four presently operating transmitters. The report is devoted to (1) a discussion of the conditions for the present and future use of the Omega system in Sweden, (2) a description of the equipment and procedures used in the investigation, and finally, (3) a presentation and discussion of the results obtained. The results are given in the form of graphs and tables of the RMS values of the Omega position lines. It was found that the Aldra-Trinidad transmitter pair is the most advantageous of the four pairs studied, both in the ordinary Omega and the Differential Omega mode of operation. For this pair the 24-h line-of-position RMS error was found to be 1.3 n.mi.(ordinary Omega) and 0.7 n.mi. (Differential Omega). The corresponding values for the other signal combinations are 2-3 and 35 times as large, respectively. Author

N72-24677# Laboratoire d'Automatique et de Ses Applications Spatiales, Toulouse (France).
ATTITUDE STABILITY CRITERION OF DEFORMABLE SATELLITES [CRITERE DE STABILITE D'ATTITUDE DES SATELLITES DEFORMABLES]
Daniel Poelaert Jan. 1972 34 p refs In FRENCH
(LAAS-NI-72-I-02) Avail: NTIS HC $3.75

Criteria necessary for a condition of attitude stability for passive or semi-active satellites are defined. A general method incorporating these criteria is applied to satellites containing elastic structures or mobile parts and a gravity gradient stabilized on multispin satellites. The numerical application of the method is discussed, and energy dissipation effects due both to the flexibility of the structure and to nutation damping devices are included. Author (ESRO)

N72-24678# Societe Europeenne de Propulsion, Bordeaux (France).
SPACECRAFT ATTITUDE CONTROL USING AUXILIARY PROPULSION MOTORS. PART 2: DETAILED ANALYSIS OF TWO CAMPA SYSTEMS [CONTROLE D'ATTITUDE DES VEHICULES SPATIAUX AU MOYEN DE MOTEURS DE PROPULSION AUXILIAIRE. LOT 2: ANALYSE DETAILLEE DE DEUX SYSTEMES CAMPA]
M. Moravie and M. Tranie Paris ESRO Jan. 1971 64 p refs In FRENCH; ENGLISH summary
(Contract ESTEC-734/69)
(ESRO-CR-36) Avail: NTIS HC $5.25

Two systems selected to compensate disturbance torques arising from the operation of the auxiliary propulsion system of a triaxially stabilized spacecraft are analyzed. In one system, the jet was deflected by means of vanes; in the other, the thruster was mounted on gimbals. A study of the configurations and performance of both systems shows the second to be preferable in the case considered. A system utilizing a jet deflected by means of secondary injection is also described. Author (ESRO)

N72-24679# European Space Research and Technology Center, Noordwijk (Netherlands).
ANALYSIS OF RESONANT GYROSCOPIC SYSTEMS BY VARIATIONAL METHODS
R. Kammueller Paris ESRO Aug. 1970 38 p refs
(ESRO-TR-11-ESTEC) Avail: NTIS HC $4.00

Direct methods are described for variational calculus as a means of determining periodic solutions of dynamic systems. The inclusion of a special work function enables the method to be extended to nonconservative systems. The variational problem is solved by means of the Ritz algorithm. An example is provided in the form of an investigation of the resonant spin oscillations of the magnetically oriented satellite ESRO-I. The specification of the FORTRAN program used for the numerical calculations of the resonance solutions is given. Author (ESRO)

N72-24680# Aeronautical Chart and Information Center, St. Louis, Mo. Technical Translation Section.
GYROSTABILIZED PLATFORMS FOR STABILIZATION OF GRAVIMETERS AND THEIR EXPERIMENTAL INVESTIGATION
V. K. Karnov, Q. D. Qznobkin, and A. Ya. Shaidenko Jan. 1972 31 p refs Transl. into ENGLISH from the monograph 'Apparature i Metody Izmereniya Sily Tyazhesti na More' Moscow, 1970 p 121-136
(AD-738029; ACIC-TC-1790) Avail: NTIS CSCL 17/7

The article contains the description of schematic diagrams and technical characteristics of the platforms "Gorizont" designed for stabilization of gravimeters. The authors propose methods and discuss the results of experimental investigation of the indicated platforms in the laboratory and under conditions of a rocking base at sea. Author (GRA)

N72-24681# Aeronautical Chart and Information Center, St. Louis, Mo. Technical Translation Section.
SOME RESULTS OF INVESTIGATIONS OF GYROSTABILIZERS
V. S. Kutepov Feb. 1972 15 p refs Transl. into ENGLISH from the Monograph Apparatura i Metody Izmereniya Sily Tyazhesti na More" Moscow, 1970 p 148-153
(AD-738075; ACIC-TC-1792) Avail: NTIS CSCL 17/7

Methods and results of investigations of power gyrostabilizers on the linear acceleration stand IS-VGU are presented. Values are obtained of the alternating deviations of gyrostabilizers depending on the amplitude and period of horizontal accelerations, as well as the values of phase shift between deviations and horizontal accelerations for instruments with a relay pendulum correction and a mechanical correction of the vertical line. Comparison of investigation results for gyrostabilizers with two types of corrections is performed. Author (GRA)

N72-24682# Control Data Corp., Bethesda, Md. Washington Systems Div.
THE EFFECTIVENESS OF THE SEE-AND-AVOID DOCTRINE: SAFE VERTICAL CLEARANCE FROM CLOUDS Final Report
V. Mangulis and W. Graham Dec. 1971 61 p refs
(Contract DOT-FA70WA-2263)
(AD-737804; FAA-RD-71-115) Avail: NTIS CSCL 01/2

The collision hazards of allowing VFR aircraft to fly in the proximity of clouds are evaluated and compared with the number of near-misses or collisions expected on a clear day due to human failure to see and avoid other aircraft. Some numerical results are presented for representative air traffic. Author (GRA)

N72-24683# Little (Arthur D.), Inc., Cambridge, Mass.
FACTORS INFLUENCING CAPACITY AND EFFICIENCY IN AIR TRAFFIC CONTROL Interim Report, Nov. 1970 - Oct. 1971
G. Raisbeck Nov. 1971 90 p refs
(Contract DOT-FA70WA-2141)
(AD-737513; FAA-RD-71-107) Avail: NTIS CSCL 17/7

Most of the report is devoted to a systematic catalogue of measurable quantities which can be related to capacity and efficiency. Each item is described to show how it affects capacity and efficiency and how it interacts with the other factors. Certain current research and development activities and the interests of some user groups have been related to the various categories of factors. Those particular groups of factors which stand out are discussed because of their absolute importance and because of the number of ways in which they interrelate to one another and to other factors. It is concluded that such a catalogue can be used to strengthen support for research and exploratory development; shaping demand must be treated jointly with increasing capacity rather than as though it were independent; and a number of specific programs of observation and experiment can be inferred, the execution of which would give additional information about the effects on capacity which many of these factors might have. Author (GRA)

N72-24684# Naval Electronics Lab. Center, San Diego, Calif.
OMEGA DATA PROGRAM
R. P. Brown and E. R. Swanson 19 Oct. 1971 86 p
(AD-738021; NELC-TD-140) Avail: NTIS CSCL 17/7

A computer program (OMEGAPHD) for analysis of Omega phase-difference data is presented. Program organization and operation procedures are included. Author (GRA)

N72-24685# Iowa State Univ. of Science and Technology, Ames.
AN INCREMENTAL VELOCITY MEASUREMENT ALGORITHM FOR USE IN INERTIAL NAVIGATION ALIGNMENT
R. L. VanAllen and R. G. Brown Feb. 1972 85 p refs
(Contract N00014-68-A-0162)
(AD-738025; ISU-ERI-Ames-72023) Avail: NTIS CSCL 17/7

In any inertial navigation system the platform must be initially aligned in some known frame of reference prior to operation in the navigation mode. Self-alignment methods are preferred in most applications, and the usual procedure is to align the platform locally level with one accelerometer axis pointing north. In the current generation of aircraft inertial systems the sensed acceleration is in the form of incremental velocity pulses. A new approach to the alignment problem is considered in this report whereby the incremental velocity pulses are modeled directly as the measurement sequence. This leads to three important changes in the filter model: Aperiodic sampling is obtained; Measurement noise due to granularity is eliminated; and a delayed state appears in the measurement equation. This latter condition forces the use of a modified form of the Kalman recursive equations. Results of Monte Carlo simulations for one set of noise parameters are given.
Author (GRA)

22 NUCLEAR ENGINEERING

Includes nuclear reactors and nuclear heat sources used for propulsion and auxiliary power. For basic research see: 24 Physics, Atomic, Molecular, and Nuclear. For related information see also: 03 Auxiliary Systems; and 28 Propulsion Systems.

N72-24686*# Aerojet Nuclear Systems Co., Azusa, Calif.
LONG-LIFE, SPACE-MAINTAINABLE NUCLEAR STAGE REGULATORS AND SHUTOFF VALVES Final Report
Mar. 1972 236 p refs
(Contract NAS8-27568)
(NASA-CR-123568; RN-A-71007) Avail: NTIS HC $14.00 CSCL 18E

The six most promising valve, regulator, and remote coupling concepts, representing the more radical designs from twenty concepts generated, were investigated. Of the three valves, one has no moving parts because shutoff sealing is accomplished by an electromagnetic field which ionized the flowing fluid. Another valve uses liquid metal to obtain sealing. In the third valve, high sealing forces are generated by heating and expanding trapped hydrogen. The pressure regulator is an electronically controlled, electromechanically operated, single state valve. Its complexity is in electronic circuitry, and the design results in less weight, increased reliability and performance flexibility, and multipurpose application. The two remote couplings feature the minimization of weight and mechanical complexity. One concept uses a low melting temperature metal alloy which is injected into the joint cavity; upon solidification, the alloy provides a seal and a structural joint. The second concept is based on the differential thermal expansion of the coupling mating parts. At thermal equilibrium there is a predetermined interference between the parts, and sealing is achieved by interference loading. Author

N72-24687*# Westinghouse Electric Corp., Pittsburgh, Pa. Astronuclear Lab.
IMPLEMENTATION OF RADIATION SHIELDING CALCULATION METHODS. VOLUME 1: SYNOPSIS OF METHODS AND SUMMARY OF RESULTS Final Progress Report
M. A. Capo and R. K. Disney Dec. 1971 173 p refs
(Contract NAS8-27047)
(NASA-CR-123600; WANL-PR(LL)-040-Vol-1) Avail: NTIS HC $10.75 CSCL 18F

The work performed in the following areas is summarized: (1) Analysis of Realistic nuclear-propelled vehicle was analyzed using the Marshall Space Flight Center computer code package. This code package includes one and two dimensional discrete ordinate transport, point kernel, and single scatter techniques, as well as cross section preparation and data processing codes, (2) Techniques were developed to improve the automated data transfer in the coupled computation method of the computer

code package and improve the utilization of this code package on the Univac-1108 computer system. (3) The MSFC master data libraries were updated. Author

N72-24688*# Westinghouse Electric Corp., Pittsburgh, Pa. Astronuclear Lab.
IMPLEMENTATION OF RADIATION SHIELDING CALCULATION METHODS. VOLUME 2: SEMINAR/WORKSHOP NOTES Final Progress Report
M. A. Capo and R. K. Disney Dec. 1971 592 p refs
(Contract NAS8-27047)
(NASA-CR-123601; WANL-PR(LL)-040-Vol-2) Avail: NTIS HC $31.75 CSCL 18F

Detailed descriptions are presented of the input data for each of the MSFC computer codes applied to the analysis of a realistic nuclear propelled vehicle. The analytical techniques employed include cross section data, preparation, one and two dimensional discrete ordinates transport, point kernel, and single scatter methods. Author

N72-24689*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A SMALL, 1400 DEG KELVIN, REACTOR FOR BRAYTON SPACE POWER SYSTEMS
Edward Lantz and Wendell Mayo 1972 18 p refs Presented at Ann. Meeting of the Am. Nucl. Soc., Las Vegas, Nev., 18-22 Jun. 1972
(NASA-TM-X-68065; E-6939) Avail: NTIS HC $3.00 CSCL 18E

A preliminary cost estimate for a small reactor in Brayton space power systems with (u-233)n or (pu-239)n as the fuel in the T-111 fuel elements totaled to about four million dollars; considered is a 22.8 in. diameter reactor with 247 fuel elements. Author

N72-24690*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CONCEPTS FOR APPLICATION OF 500- TO 2500-We BRAYTON POWER SYSTEMS FOR SHUTTLE-LAUNCHED MISSIONS
Henry B. Block and Harvey S. Bloomfield 1972 13 p refs Proposed for Presentation at the 7th Intersociety Conversion Eng. Conf., San Diego, Calif., 25-29 Sep. 1972
(NASA-TM-X-68069) Avail: NTIS HC $3.00 CSCL 10A

A mini-Brayton power system in the power range of 500 to 2500 We utilizing the multihundred Watt isotope heat source was studied for use in shuttle-launched experiments. The system consists of a single closed gas loop containing a single-shaft, gas cooled, compressor-alternator turbine assembly; a heat source heat exchanger assembly; a startup battery package; an electrical control module; a recuperator; a gas radiator; and a multifoil superinsulation system. The basic configuration and major nuclear payloads for shuttle integration are discussed. It is concluded that mini-Brayton systems have low isotope inventories and high electrical output per thermal input, and have the capability of flying all earth orbital and interplanetary missions with little degradation in performance. F.O.S.

N72-24691*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ISOTOPE BRAYTON ELECTRIC POWER SYSTEM FOR THE 500 TO 2500 WATT RANGE
Robert P. Macosko, Gearld J. Barna, H. Bruce Block, and Bill D. Ingle [1972] 11 p refs Proposed for presentation at 7th Intersoc. Energy Conversion Eng. Conf., San Diego, Calif., 25-29 Sep. 1972
(NASA-TM-X-68072) Avail: NTIS HC $3.00 CSCL 10A

An extensive study was conducted at the Lewis Research Center to evaluate an isotope Brayton electric power system for use in the 500 to 2500 W power range. Overall system simplicity was emphasized in order to reduce parasitic power losses and improve system reliability. Detailed parametric cycle analysis, conceptual component designs, and evaluation of system packaging were included. A single-loop system (gas) with six major components including one rotating unit was selected. Calculated net system efficiency varies from 23 to 28 percent over the power range. Author

N72-24692# Los Alamos Scientific Lab., N.Mex.
NUCLEAR SAFETY OF AN AIRBORNE THERMAL REACTOR Status Reports
J. C. Vigil, B. M. Carmichael, and G. H. Best Dec. 1971 3 p refs Prepared for AFWL, Kirtland AFB, N.Mex.
(Contract W-7405-eng-36)
(LA-4853) Avail: NTIS

Tests were made to assist in the development of containment vessels which will survive impact deformations without rupturing or leaking, to determine the deformation of the reactor cores due to impact, and to evaluate engineered safety features under impact. The Reactor Theory Group is supporting this work by assessing the nuclear criticality and other reactor parameters for both normal and deformed core configurations. It was proposed that small spheres of diluent poison material be placed around the periphery of the reflector in the gas cooled, water moderated thermal reactor concept to serve as a shutdown mechanism in case of a core meltdown. Investigations of the effect of the diluent poison on the normal configuration are described. An evaluation of the effect of complete compaction of the core is also presented. Author (NSA)

N72-24693# Soreq Research Establishment, Israel Atomic Energy Commission, Yavneh.
[NUCLEAR RESEARCH] Annual Report, Jan. - Dec. 1970
Dec. 1970 262 p refs
(IA-1238) Avail: AEC Depository Libraries

Summaries of research are presented on neutron and reactor physics, nuclear physics, solid state physics and metallurgy, mathematics and theoretical physics and chemistry, high energy and nuclear chemistry, physical and inorganic chemistry, spectroscopy, geochemistry, irradiation of food and industrial products, applications of tracer techniques and radioisotopes biology and medicines, health physics, nuclear safety, instrumentation and methods for vacuum technology, and the production to radioisotopes and labeled compounds. NSA

N72-24694# Commissariat a l'Energie Atomique, Grenoble (France). Centre d'Etudes Nucleaires.
CRITICAL FLOW EXPERIMENTS IN A FORCED CONVECTION BOILING SODIUM LOOP
J. Costa and P. Charlety Sep. 1971 18 p refs Presented at 4th Intern. Seminar on Heat and Mass Transfer in Liquid Metals, Trogir, Yugoslavia, 6-11 Sep. 1971
(CEA-Conf-1939; Conf-710942-2) Avail: AEC Depository Libraries

Consequences of critical flows occurring in a flashing facility and in a forced convection boiling loop are presented. A method is derived for determining if critical conditions are reached at the exit of a boiling test section in a forced convection loop. The method was used on a boiling sodium loop and critical flow rate data are presented. NSA

N72-24695# Commissariat a l'Energie Atomique, Grenoble (France). Centre d'Etudes Nucleaires.
MIXED CONVECTION IN LIQUID METALS [CONVECTION MIXTE DANS LES METAUX LIQUIDES]
R. Martin, R. Ricque, Ph. Vernier, and M. Wendling Sep. 1971 36 p refs In FRENCH Presented at Conf. on Natural and Mixed Conv. and its Ind. Appl., Ermenonville, France, 13-18 Sep. 1971
(CEA-Conf-1889; Conf-710939-1) Avail: AEC Depository Libraries

Mixed convection in sodium was studied experimentally as part of a research program on the thermohydraulics of integrated sodium-cooled reactor vessels. The experimental device consists of a closed circuit which includes a test section. The results

obtained for longitudinal and transverse temperature profiles, and thermal exchange coefficients, are presented. NSA

N72-24696# Commissariat a l'Energie Atomique, Grenoble (France). Centre d'Etude Nucleaires.

MIXED CONVECTION IN SODIUM

M. Wendling, R. Ricque, and R. Martin Sep. 1971 23 p refs Presented at 4th Intern. Seminar on Heat and Mass Transfer in Liquid Metals, Trogir, Yugoslavia, 6-11 Sep. 1971

(CEA-Conf-1885; Conf-710942-1) Avail: AEC Depository Libraries

Experimental heat transfer data obtained in a vertical asymmetrically heated rectangular channel at low Peclet number are presented. The effect of body forces is well correlated with the G/Re ratio and good agreement is found with published data. Measurements of transverse temperature profiles show that a fully developed flow may be defined in the last part of the channel. NSA

N72-24697# Oak Ridge National Lab., Tenn. Isotopes Information Center.

CORRELATION OF OUTPUT PARAMETERS OF RADIOISOTOPIC THERMOELECTRIC GENERATORS (IZOTEGS) WITH LOAD

A. Ya. Malyshev, A. I. Ragozinskii, N. P. Korotkov, A. I. Dmitriev, and B. P. Sapelkin [1972] 5 p refs Transl. into ENGLISH from Radiats. Tekh. (Moscow), v. 6, no. 6, 1971 p 158-163

(ORNL-tr-2558) Avail: NTIS

Results are presented of long term tests on 8 different radioisotope fueled thermoelectric generators developed in the USSR. The tests were performed to determine the effects of load on the output characteristics of the generators. It is concluded that for maximum efficiency, energy from the thermoelectric generators should be used directly, i.e., without the use of output voltage transformers. NSA

N72-24698# Oak Ridge National Lab., Tenn. Isotopes Information Center.

DEPENDABILITY OF RADIOISOTOPIC THERMOELECTRIC GENERATORS

N. P. Korotkov, A. I. Dmitriev, A. Ya. Malyshev, and B. P. Sapelkin [1972] 3 p refs Transl. into ENGLISH from Radiats. Tekh. (Moscow), v. 6, no. 6, 1971

(ORNL-tr-2559) Avail: NTIS

The development of radioisotope thermoelectric generators in the USSR is reviewed with information on the design, construction, life testing, and operation at remote terrestrial sites such as Antarctica and high mountain meteorology stations. The heat sources used were Ce-144 and Sr-90. NSA

N72-24699# Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires.

SPITFIRE LOOP [LA BOUCLE A TROMPE SPITFIRE]

19 May 1971 9 p refs In FRENCH Presented at Euaton Conf. on Radiation Devices, Cadarache, France, 10 Jun. 1971

(CEA-Conf-1882; Conf-710628-5) Avail: AEC Depository Libraries

The Spitfire loop, intended for irradiating in Osiris, high temperature reactor fuel elements under in-pile conditions (purified He, and high temperatures) is described. The irradiation can be effected, either in the core (fast and thermal neutrons) or outside the reactor vessel, if the appropriate means are used (e.g., themal neutrons cycling). The loop is of the central injector type; it does not have any moving parts in its in-pile component. The materials requiring maintenance are assembled out-of-pile. After irradiation, the fission product deposits released by the fuel element are retained by the walls of an exchange recuperator at 750 to 150 C to be studied later. NSA

N72-24700# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Neutronenphysik und Reaktortechnik.

RESULTS OF HEAT TRANSFER AND PRESSURE LOSS MEASUREMENTS WITH HELIUM IN A TUBE BUNDLE

J. Marek and K. Maubach Sep. 1971 60 p refs

(KFK-1482) Avail: AEC Depository Libraries

Results are reported of measurements performed with respect to pressure drop and heat transfer of helium at a pressure of 40 atm flowing through a bundle of 9 tubes in a square arrangement. The tubes were heated by direct current; the heating power was from 30 to 300 kW which corresponds to a power of 16 to 160 W/cm at the heating tube. The tubes were smooth and arranged in a smooth square channel at a distance ratio of c/d = 1.283. The Reynolds numbers ranged from 10,000 to 3 x 100,000. Wall temperatures up to 700 C were measured. The isothermal friction coefficients of the entire bundle, including the channel wall, were determined to be about 7% less than those of the circular tube. Transformed to the conditions applicable to an arrangement with an infinite number of rods, the results were about 3% less than those of the circular tube. Author (NSA)

N72-24701# Commissariat a l'Energie Atomique, Saclay (France). Center d'Etudes Nucleaires.

SAFETY REACTIMETER

Y. Plaige 2 Mar. 1971 8 p In FRENCH Presented at IAEA Working Group on Operation and Instrumentation of Nucl. Power Plants, Vienna.

(CEA-CONF-1793; CONF-710340-3) Avail: AEC Depository Libraries

Reactimeters are very sensitive and very fast instruments. It is for this reason that it is proposed to use them for the safety of reactors, particularly fast reactors in order to detect coolant incidents before the thermal effects have time to be manifested. Because of some simplifications and technological advances, it is possible to construct a simple, sure, and economical instrument. The principle and characteristics of such safety reactimeters are given. The device was tested on a reactor and the results were very satisfactory. Author (NSA)

N72-24702# Mound Lab., Miamisburg, Ohio.

INVESTIGATION OF SUPPLEMENTARY MATERIALS USED IN THE PIONEER RTGS AND CAPSULE SHIPPING CONTAINERS

R. E. Zielinski and D. E. Etter 12 Jan. 1972 24 p

(Contract AT(33-1)-GEN-53)

(MLM-1882) Avail: NTIS

The program objective was to determine what material(s), if any, could be released to the internal structure of the RTG and the shipping container from the nonmetallic components of these structures as their temperatures were increased. The materials studied were POCO graphite; pyrolytic graphite; pressed, sintered, and machined ZrO2; and finally Min-K 1301. Residual gas and thermal gravimetric analyses were the primary methods of investigation. All of the materials were observed to yield organic off-gas products. In addition to the organic materials, the Min-K 1301 also released large quantities of water vapor and hydrogen relative to the other off-gas products. The test results indicated that even a more rigorous outgassing procedure and controlled atmosphere handling of Min-K 1301 seemed to be a residual that remained after the Min-K was outgassed according to specifications. Author (NSA)

N72-24703# Oak Ridge National Lab., Tenn.

ORNL ISOTOPIC POWER FUELS Quarterly Report, period ending 30 Sep. 1971

Eugene Lamb Dec. 1971 36 p refs

(Contract W-7405-eng-26)

(ORNL-4750) Avail: NTIS

The development of fuel forms with optimum design for use at temperature up to 2,000 C is discussed. The process involves obtaining the characteristics of isotopic power and heat sources for anticipated applications in aerospace, terrestrial, and marine environments. The physical and chemical properties of the compound and source form, such as thermal conductivity, density, gas retention, and melting point must be determined. Compatibility of the fuel form with container materials must be

established to ensure adequate containment during the intended lifetime of the mission. Author

N72-24704# Oak Ridge National Lab., Tenn.
ENGINEERING DEVELOPMENT STUDIES FOR MOLTEN-SALT BREEDER REACTOR PROCESSING NO. 7
L. E. McNeese Feb. 1972 92 p refs
(Contract W-7405-eng-26)
(ORNL-TM-3257) Avail: NTIS

Calculations were made to identify important operating parameters in the fluorination-reductive extraction and metal transfer flowsheet. Design calculations were made for induction heating of a frozen wall fluorinator. The first engineering experiment for studying removal of rare earths from single fluid MSBR fuel salt by the metal transfer process was completed. Studies were also made on purification of salt by continuous methods, semicontinuous reductive extraction experiments in a mild steel facility, and axial dispersion coefficients in packed columns. NSA

23 PHYSICS, GENERAL

Includes acoustics, cryogenics, mechanics, and optics. For astrophysics see: 30 Space Sciences. For geophysics and related information see also: 13 Geophysics; 20 Meteorology; and 29 Space Radiation.

N72-24705*# Virginia Univ., Charlottesville. Div. of Aerospace Engineering and Engineering Physics.
APPLICATION OF QUASI-LINEARIZATION TECHNIQUES TO THE ANALYSIS OF AERODYNAMIC-NOISE FIELDS Final Report
Wesley L. Harris, Sr. Mar. 1972 44 p refs
(Grant NGR-47-005-147)
(NASA-CR-112084; AEEP-4074-105-72U) Avail: NTIS HC $4.25 CSCL 20A

The method of parametric differentiation was used as a means of obtaining solutions which describe aerodynamically generated sound fields, and which are valid over an increased range of a specific parameter. Details of applying the method to the problem of calculating the sound field of two rectilinear vortices rotating about an axis between them in a compressible medium are discussed. Pressure distribution in the far field are obtained. Parametric differentiation was also applied to the calculation of aerodynamic sound generated by a rotating cylinder in a viscous, compressible medium. The formulation of this problem in parametric space is given, and a procedure for obtaining a solution is outlined. Author

N72-24706# Washington Univ., St. Louis, Mo. Dept. of Applied Mathematics and Computer Science.
MATHEMATICAL INVESTIGATIONS IN CONNECTION WITH FINITE AMPLITUDE ACOUSTICAL WAVE PROPAGATION, VOLUME 2
Ervin Y. Rodin Mar. 1972 65 p refs
Avail: NTIS HC $5.25

Three distinct studies related to the propagation of one dimensional waves of finite amplitude in thermoviscous media are investigated. These are as follows: (1) the establishment of a variational principle, through which a definite connection between exact and approximate results is described; (2) the reformulation of already known one-dimensional results, in a new, integral form; and (3) the detailed description of a computer program, written in a combination of FORTRAN 4, PL/1, and FORMAC, the purpose of which is to obtain numerical results from either the series or the integral formulation of the known one dimensional results. This computer program also contains a general plotting subroutine. Finally, several results of a general nature, concerning three dimensional propagation of waves of finite amplitude, are also given. Author

N72-24707*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A 12 COIL SUPERCONDUCTING BUMPY TORUS MAGNET FACILITY FOR PLASMA RESEARCH
J. Reece Roth, A. David Holmes, Thomas A. Keller, and Walter M. Krawczonek 1972 11 p refs Presented at the Appl. Superconductivity Conf., Annapolis, 1-3 May 1972; sponsored by Am. Phys. Soc., NSF, NASA, IEEE, and Navy
(NASA-TM-X-68063; E-6895) Avail: NTIS HC $3.00 CSCL 20C

A summary is presented of the performance of the two-coil superconducting pilot rig which preceded the NASA Lewis bumpy torus. This pilot rig was operated for 550 experimental runs over a period of 7 years. The NASA Lewis bumpy torus facility consists of 12 superconducting coils, each with a 19 cm in diameter and capable of producing magnetic field strengths of 3.0 teslas on their axes. The magnets are equally spaced around a major circumference 1.52 m in diameter, and are mounted with the major axis of the torus vertical in a single vacuum tank 2.59 m in diameter. The design value of maximum magnetic field on the magnetic axis (3.0 teslas) was reached and exceeded. A maximum magnetic field of 3.23 teslas was held for a period of 60 minutes, and the coils did not go to normal. When the coils were charged to a maximum magnetic field of 3.35 teslas, the coil system was driven normal without damage to the facility. Author

N72-24708# National Defense Research Organization TNO, Rijswijk (Netherlands).
THE INFLUENCE OF THE APERTURE OF THE OPTICAL SYSTEM OF AEROSOL PARTICLE COUNTERS ON THE RESPONSE CURVE
F. Oeseburg Nov. 1971 17 p refs
(CL-1971-28; TDCK-059055) Avail: NTIS HC $3.00

The influence of the collecting cone aperture of an optical system of aerosol particle counters on the response curve was examined by calculating the curve for a sphere with a relative refractive index 1.491 and size parameters between 0.1 and 30. It was found that optimum response curves are obtained in optical systems in which the radiation scattered between 40 and 120 deg is collected. This may be realized by using an elliptical mirror. Author

N72-24709*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A PROCEDURE FOR PREDICTING INTERNAL AND EXTERNAL NOISE FIELDS OF BLOWDOWN WIND TUNNELS
Robert N. Hosier (Army Air Mobility R and D Lab.) and William H. Mayes Washington May 1972 25 p refs
(NASA-TM-X-2556; L-8132) Avail: NTIS HC $3.00 CSCL 20A

The noise generated during the operation of large blowdown wind tunnels is considered. Noise calculation procedures are given to predict the test-section overall and spectrum level noise caused by both the tunnel burner and turbulent boundary layer. External tunnel noise levels due to the tunnel burner and circular jet exhaust flow are also calculated along with their respective cut-off frequency and spectrum peaks. The predicted values are compared with measured data, and the ability of the prediction procedure to estimate blowdown-wind-tunnel noise levels is shown. Author

N72-24710*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DETAILED MEASUREMENTS OF THE H BETA LINE SHAPE IN A TRANSIENT PLASMA USING A FIBER OPTICS SLIT SYSTEM
G. H. Stickford, Jr. 1 May 1972 12 p refs Revised Supersedes AIAA-72-106 Backup document for AIAA Synoptic "Measurements of of the H Beta Line Shape using a Fiber Optics Slit System", scheduled for publication in AIAA Journal in Oct. 1972

(Contract NAS7-100)
(NASA-CR-126550; AIAA-72-106) Avail: NTIS HC $3.00 CSCL 20F

Through the use of fiber optics, a series of very narrow slits have been constructed and placed at the exit plane of a spectrograph. Plasma radiation which is dispersed by the spectrograph is incident on the slits and is transmitted to separate phototubes via the quartz fibers. With this technique, time resolved measurements of the spectral shape of the hydrogen H beta line have been made and used to determine the electron density of a transient plasma. Data obtained in a shock tube indicated that the thermodynamic conditions behind the reflected shock in a mixture of 20 percent H 80 percent He correspond to theoretically predicted conditions. Author

N72-24711*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CORRELATION OF TOTAL SOUND POWER AND PEAK SIDELINE OASPL FROM JET EXHAUSTS
Uwe H. vonGlahn [1972] 10 p refs Presented at 5th Fluid and Plasma Dyn. Meeting, Boston, 26-28 Jun., 1972; Sponsored by Am. Inst. of Aeron. and Astronaut.
(NASA-TM-X-68059; E-6921) Avail: NTIS HC $3.00 CSCL 20A

An empirical analysis of jet noise is made for convergent exhaust nozzles. An engineering approach to the correlation of total sound power and mixmum sideline overall sound pressure level (OASPL), at 200 ft, is presented for both subsonic and supersonic jets based on available data. Data correlation for subsonic jets shows no dependency of total sound power and maximum sideline OASPL on jet density. The analysis for supersonic jets results in a correlation parameter for jet total sound power consisting of the conventional Lighthill parameter modified by considerations of jet Mach number and jet acoustic velocity. Similar parameters also correlate the maximum sideline OASPL for supersonic jets. Author

N72-24712# Centre National de la Recherche Scientifique, Marseilles (France). Lab. d'Astronomie Spatiale.
ABSOLUTE CALIBRATION OF LARGE-FIELD SOURCES. PUV NIGHT CAMERAS: EXPERIMENT OF 4 APRIL 1967 [ETALONNAGE ABSOLU DES SOURCES ETENDUES. CAMERAS NOCTURNES PUV: EXPERIENCE DU 4 AVRIL 1967]
Jean-Pierre Sivan and Maurice Viton Sep. 1971 32 p refs In FRENCH
(ASTR-01-71) Avail: NTIS HC $3.75

Stellar photometry of the Milky Way and zodiacal light by means of a microphotometer and an isodensity tracer is described. Knowledge of the characteristics of the emulsion for a source filtered in the ultraviolet enables the densities to be converted to brightness values expressed in absolute units, using a deuterium lamp as standard. Author (ESRO)

N72-24713# Institut Franco-Allemand de Recherches, St. Louis (France).
ADIABATIC DEPOLARIZATION OF A FERROMAGNETIC MATERIAL BY HYDROSTATIC COMPRESSION Ph.D. Thesis - Lyon Univ. [DEPOLARISATION ADIABATIQUE D'UN FERROELECTRIQUE PAR COMPRESSION HYDROSTATIQUE]
F. Bauer 13 Jan. 1971 82 p refs In FRENCH
(ISL-1/71) Avail: NTIS HC $6.25

Adiabatic depolarization of ferroelectric materials was studied. An experimental device was designed which permitted the recovery of energy stored in ferroelectric ceramics by previous polarization. The release of energy was achieved by applying adiabatic hydrostatic pressure. The amount of recovered energy is considered as a function of characteristics of the crystal such as remanant polarization, permissivity and leak resistance. It is shown that adiabatic depolarization is accompanied by a phase transition (ferroelectric to paraelectric). Crystals which have a high transition energy should be used. Author (ESRO)

N72-24714# National Physical Lab., Teddington (England). Div. of Optical Metrology.
INTERFEROMETRIC TESTING OF ASPHERIC SURFACES
K. G. Birch and Frances J. Green Feb. 1972 49 p refs
(NPL-OP-Met-12) Avail: NTIS HC $4.50

Three methods to study slightly concave, very concave, and slightly convex aspherical surfaces are assessed. They are (1) lateral shearing interferometry where interference occurs between two wavefronts originating from the aspherical surface and slightly sheared relative to each other; (2) an adaptation of the Twyman-Green interferometer using a second aspherical surface as a reference surface, the resultant interferogram indicating the difference between the reference aspherical surface and that under test; (3) a form of grazing incidence interferometry resulting in a desensitization of the interference pattern by increasing the wavelength of the illumination. The advantages and disadvantages of each of these methods related to the ease of measurement or interpretation are discussed. All interferometers operate successfully with unaluminized surfaces, lateral shearing and grazing incidence interferometers requiring laser illumination, while modified Twyman-Green require a filtered mercury source. Author (ESRO)

N72-24715# Naval Research Lab., Washington, D.C.
ACOUSTIC NEAR-FIELD MEASUREMENTS OF A FREE-FLOODED MAGNETOSTRICTIVE RING Interim Report
Joel A. Sinsky 30 Dec. 1971 34 p refs
(AD-737615; NRL-7328) Avail: NTIS CSCL 09/1

Precision acoustic near-field pressure magnitude and phase measurements have been made of radially oscillating free-flooded cylindrical ring. The measurements demonstrate the potential of the NRL Acoustic Research Tank Facility for careful determination of near-field pressure magnitude and phase. Various pressure profiles and phase profiles were plotted. Besides demonstrating results possible with the Tank Facility the profiles were used in deriving dynamic properties of the ring. The transmitting efficiency, surface velocity, and radiation impedance of the ring were derived from the near-field data and were independently confirmed by other methods. Further analysis than that presented here can predict the acoustic interaction through the medium among many rings in an array. Author (GRA)
Author (GRA)

N72-24716# Naval Research Lab., Washington, D.C.
A NORMAL MODE COMPUTER PROGRAM FOR CALCULATING SOUND PROPAGATION IN SHALLOW WATER WITH AN ARBITRARY VELOCITY PROFILE Final Report
Alfred V. Newman and Frank Ingenito Jan. 1972 70 p refs
(AD-737629; NRL-MR-2381) Avail: NTIS CSCL 20/1

A computer program has been written in FORTRAN for the CDC 3400/3600/3800 computers which solves the Z dependent part of the Helmholtz equation for a two fluid shallow water model by means of a finite difference technique. Sound speed profiles for the model are entered as discrete sets of points. The first fluid is subdivided into N incremental layers to permit the use of the finite difference equations. A linear interpolation is performed between the profile depths and the depths at which the incremental layers are defined to give sound speeds for the latter. The boundary conditions for continuity of acoustic pressure and the vertical particle velocity are matched at the interface between the two fluids. The effect on each normal mode amplitude in the first fluid due to an assumed small absorption in the second fluid is found. Author (GRA)

N72-24717# Florida Univ., Gainesville. Communication Sciences Lab.
UNDERWATER AUDIO-FREQUENCY TRANSMISSION AS A FUNCTION OF SIMULATED DISTANCE IN MODELS
Richard A. II Rhodes, Harry Hollien, Howard B. Rothman, and Stephen H. Feinstein 12 Dec. 1971 7 p refs
(Contract N00014-68-A-0173-0008)

(AD-737746; CSL/ONR-13) Avail: NTIS CSCL 17/2

The ultrasonic modeling technique is being used to investigate sound propagation in the shallow ocean in connection with a project on basic aspects of underwater speech and hearing. The ultrasonic simulation experiment is carried out in a water-filled concrete tank 3 ft x 4 ft x 4 in side-lined with sound-absorbing rubber matting and bottom-lined with soft rubber to simulate sand. The electroacoustical transducers are a matched pair of lead zirconite-titanate piezoelectric crystals of frequency 400 kHz with wire probes projecting beneath the water surface. One actual problem simulated is one in which field measurements were previously taken at 16 frequencies from 0.10 kHz to 5 kHz in the Gulf of Mexico, in 31 meters of 76F water over a flat sandy bottom. Using a single frequency, the modeling experiment simulates these 15 frequencies by appropriate distance sealing.
Author (GRA)

N72-24718# Naval Ordnance Lab., White Oak, Md.
SCATTERING OF ELECTROMAGNETIC RADIATION BY APERTURES. 2: OBLIQUE INCIDENCE ON THE SLOTTED PLANE FOR PARALLEL POLARIZATION
Louis F. Libelo and J. N. Bombardt (Harry Diamond Labs.) 15 Jan. 1972 47 p refs
(ZR00001010)
(AD-738421; NOLTR-72-25) Avail: NTIS CSCL 20/3

The report is the second in a series of investigations into the diffraction of electromagnetic radiation by apertures in conducting screens. Herein is presented a technique for obtaining the fields everywhere for plane electromagnetic radiation incident obliquely on a slotted conducting plane. The case studied is that in which the incident electric field is linearly polarized parallel to the slot axis. Numerical solution for the scattering cross-section and the angular distribution for arbitrary incidence direction and for a large range of values of the ratio of slot width to incident wavelength are presented in this work. Comparison with results obtained earlier by others show the newer results to be in excellent agreement.
Author (GRA)

N72-24719# Michigan Univ., Ann Arbor. Cooley Electronics Lab.
UNDERWATER SOUND PROPAGATION IN THE STRAITS OF FLORIDA. THE PRELIMINARY ANALYSIS OF THE MIMI EXPERIMENT OF 1970
Richard M. Heitmeyer Feb. 1972 215 p ref
(Contract N00014-67-A-0181-0032)
(AD-737692; TR-213) Avail: NTIS CSCL 20/1

An underwater acoustic propagation experiment was conducted during the month of November 1970 as part of the Project MIMI propagation and signal processing research program. A periodic broadband signal, modulating a 420 HZ carrier was transmitted continuously across the Straits of Florida for 19 days. At the receiving site, the power and phase angle of the carrier, the power in the signal sidebands, and the noise power in the signal band were measured. In addition, the total power and the power spectrum in a narrow band about the carrier line were determined as a measure of the modulation due to the forward-scattered surface reverberation. Finally, the correlation of the received signal with a stored reference was computed to measure the multipath structure and its stability. This report presents a brief description of the acoustical range, the experiment, and the preliminary analysis of the data.
Author (GRA)

N72-24720# Defense Documentation Center, Alexandria, Va.
FARADAY ROTATION Report Bibliography, Mar. 1961 - Sep. 1971
Mar. 1972 144 p refs
(AD-738350; DDC-TAS-71-66-1) Avail: NTIS CSCL 20/6

The bibliography on Faraday effects and rotations has been prepared from Defense Documentation Center collection. This supercedes the bibliography prepared in February 1970. Corporate Author-Monitoring Agency, Subject, Title, and Personal Author Indexes are included.
Author (GRA)

N72-24721# Harry Diamond Labs., Washington, D.C.
INDUCTION-FIELD DETERMINATION OF SENSITIVITY FOR LOOP ANTENNA TYPE FUZES
Peter Alexander Dec. 1971 52 p
(AD-737583; HDL-TM-71-40) Avail: NTIS CSCL 19/1

An investigation has been made to establish if induction field measurements performed in a laboratory Ecco-Absorb chamber are applicable to determine standard sensitivity for fuzes employing loop antennas. Diode detector voltage values obtained in the near field of the fuze are used to predict voltage values in the far field, which in turn are related to standard sensitivity. It had been postulated that by measuring signal voltage in the induction field of the fuze that standard sensitivity could be predicted.
Author (GRA)

N72-24722# California Inst. of Tech., Pasadena. Div. of Engineering and Applied Science.
THE ORIGINS OF THE NONLINEAR REFRACTIVE INDICES OF LIQUIDS AND GLASSES Ph.D. Thesis
Adelbert Owyoung Dec. 1971 96 p refs Sponsored in part by Ford Found. and Fairchild Camera and Instr. Corp.
(Grant AF-AFOSR-1492-68; AF Proj. 9768)
(AD-737515; AFOSR-71-3132TR; SR-12) Avail: NTIS CSCL 20/6

Contents: The formal description of nonlinear optical phenomena; The determination of the third order nonlinear susceptibility tensor in isotropic media; Mechanisms for the third order nonlinear polarization in isotropic media; Interpretation of the nonlinear polarization; Experimental implementation of the ellipse rotation study; Interpretation of the nonlinear susceptibility measurements in isotropic media.
GRA

N72-24723# Army Foreign Science and Technology Center, Charlottesville, Va.
THE INVARIANCE OF THE SPEED OF LIGHT IN THE SPECIAL THEORY OF RELATIVITY
G. A. Kotelnikov 27 Jan. 1972 9 p refs Transl. into ENGLISH from Vestin. Mosk. Univ. (Moscow), no. 4, 1970 p 371-374
(AD-737965; FSTC-HT-23-403-72) Avail: NTIS CSCL 20/10

It is demonstrated that in Galilean systems of coordinates, invariance of the four dimensional interval does not mean invariance of the speed of light, but that the set of physically observable phenomena remain as before.
Author (GRA)

N72-24724# Army Electronic Proving Ground, Fort Huachuca, Ariz.
METHODOLOGY STUDY: INFRARED-OPTICAL PROPAGATION INVESTIGATION Final Report
Freeman F. Hall and Colin M. Giorgi Mar. 1972 54 p refs
(AD-738172; USAEPG-FR-735) Avail: NTIS CSCL 17/5

The investigation has evaluated the application of infrared-optical propagation data correction techniques to the US Army Electronic Proving Ground's engineering test program. Scope of the effort covered a CDC documentation survey of 1972-80 time frame infrared-optical systems, the determination of the pertinent infrared-optical system test parameters which can be affected by propagation conditions in the Fort Huachuca meteorological environment and the evaluation of existing propagation models and data correction methodology for application to engineering test programming and data analysis requirements. The report considers five classes of electro-optical systems and four standard atmospheric conditions characteristic of the Fort Huachuca, Arizona test area. The methodology required to compute expected system performance degradation is presented to include the results of computations for a range of typical operational modes for each of the classes of systems and the supporting computer programs required to calculate the contrast reduction.
Author (GRA)

N72-24725# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE INITIAL STAGE OF THE PROCESS OF ELECTRICAL

EROSION (DIELECTRIC BREAKDOWN)
I. A. Bakuto and I. G. Nekrashevich 19 Nov. 1971 22 p refs Transl. into ENGLISH of the book "Fiz. Osnovy Elektroiskrovoi Obrabotki Materialov" Moscow, Izd-vo Nauka, 1966 p 7-15
(AD-737889; FTD-MT-24-914-71) Avail: NTIS CSCL 20/3

An attempt is made to present a general theory of dielectrics breakdown of all dielectrics, based on conventional energetic considerations. The theory of thermal breakdown and Townsend's equations are derived as special cases of this general theory. An equation is derived for the description of the phenomena during the breakdown of dielectrics. It is applicable to dielectrics in all states of aggregation, since no restrictions are imposed mathematically on the properties of the dielectrics.
GRA

N72-24726# Radio Corp. of America, Princeton, N.J.
EFFECTS OF TURBULENCE INSTABILITIES ON LASER PROPAGATION Quarterly Progress Report, 9 Sep. - 8 Dec. 1971
David A. DeWolf Griffiss AFB, N. Y. RADC Jan. 1972 12 p ref
(Contract F30602-71-C-0356; ARPA Order 1279)
(AD-737838; PRRL-71-CR-44; RADC-TR-72-32; QPR-7) Avail: NTIS CSCL 20/6

Three developments are reported briefly, (a) an extension of average focalspot areas under turbulent atmospheric conditions to non-zero elevation angles, (b) computation of the temporal power spectrum of angle-of-arrival fluctuations, and (c) development of a new formalism for the irradiance of a plane wave leading to log-normal statistics and promising a saturation effect for the irradiance (not yet computed). Author (GRA)

24 PHYSICS, ATOMIC, MOLECULAR, AND NUCLEAR

Includes atomic, molecular, and nuclear physics. For applications see: 22 Nuclear Engineering. For related information see also: 29 Space Radiation.

N72-24727*# Boeing Co., Seattle, Wash.
RADIOACTIVE NONDESTRUCTIVE TEST METHOD
James R. OBrien and Kent E. Pullen Dec. 1971 69 p refs Prepared for JPL
(Contract NAS7-779)
(NASA-CR-126655; D180-14227-1) Avail: NTIS HC $5.50 CSCL 20H

Various radioisotope techniques were used as diagnostic tools for determining the performance of spacecraft propulsion feed system elements. Applications were studied in four tasks. The first two required experimental testing involving the propellant liquid oxygen difluoride (OF2): the neutron activation analysis of dissolved or suspended metals, and the use of radioactive tracers to evaluate the probability of constrictions in passive components (orifices and filters) becoming clogged by matter dissolved or suspended in the OF2. The other tasks were an appraisal of the applicability of radioisotope techniques to problems arising from the exposure of components to liquid/gas combinations, and an assessment of the applicability of the techniques to other propellants. Author

N72-24728*# Teledyne Brown Engineering, Huntsville, Ala.
NUCLEAR RADIATION ANALYSIS Summary Report
R. J. Knies, N. R. Byrn, and H. T. Smith Feb. 1972 48 p refs
(Contract NAS8-26557)
(NASA-CR-123636; SE-SSL-1476) Avail: NTIS HC $4.50 CSCL 20H

A study program of radiation shielding against the deleterious effects of nuclear radiation on man and equipment is reported. The methods used to analyze the radiation environment from bremsstrahlung photons are discussed along with the methods employed by transport code users. The theory and numerical methods used to solve transport of neutrons and gammas are described, and the neutron and cosmic fluxes that would be present on the gamma-ray telescope were analyzed. F.O.S.

N72-24729# Nice Univ. (France). Lab. de Physique Theorique.
CROSSED CHANNEL UNITARITY CONSTRAINT ON REGGE CUT AMPLITUDES
F. Guerin May 1972 19 p refs
(N-TH-72/3) Avail: NTIS HC $3.00

Conventional cut models violate elastic unitarity in the crossed channel. It is shown that the remedy is simple and unique, at least for Regge-Regge cuts. The fulfillment of the unitarity constraint leads to a modification of the strength of the cut, but hardly modifies the t-dependence, the phase, or the spin-dependence of the Regge cut amplitude. The absorption correction depends on one parameter, whose effect is to modify the conventional strength of the absorption by a factor ranging from 0.5 to 1.6. Author

N72-24730# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).
ORGANIZATION AND RESEARCH PROGRAM OF THE GESSELLSCHAFT FOR STRAHLEN-UND UMWELTFORSCHUNG MBH IN THE FEDERAL REPUBLIC OF GERMANY
A. Roersch, H. Zwenk, J. B. Th. Aten, R. A. Oosterbaan, and D.M. W. Elskamp Mar. 1972 30 p In ENGLISH and DUTCH
(MBL-1972-3; TDCK-59578) Avail: NTIS HC $3.00

A summary is presented of the research activities of the Gesellschaft and a more detailed description of the laboratories in Munchen and Neuherberg which were visited. The aim of the visit was to learn how experimental experience in radiation research is applied to environmental research in West Germany. The organization of the Gesellschaft is also discussed. Author

N72-24731# Technische Hogeschool, Delft (Netherlands).
NEUTRON DEPOLARIZATION STUDY OF FERROMAGNETIC DOMAIN STRUCTURES Ph.D. Thesis
Maltheus Theodorus Rekveldt 23 Feb. 1972 99 p refs
Avail: NTIS HC $7.00

The theory of neutron depolarization in three dimensions is considered. The experimental apparatus is described. The results of measurements in nickel foils at room temperature and in nickel plates at the Curie temperature are presented. K.P.D.

N72-24732# University of Southern Calif., Los Angeles. Dept. of Electrical Engineering.
INVARIANT IMBEDDING AND RADIATION DOSIMETRY. 4: FINITE ORDER SCATTERING OF GAMMA RADIATION BY A TARGET SLAB
R. Bellman, S. Ueno, and R. Vasudevan Apr. 1972 25 p refs
(Grant GM-16197-04)
(TR-72-16) Avail: NTIS HC $3.25

Computation of the transmission and reflection functions of the radiation impinging on a slab with scattering properties which are unisotropic and incoherent are considered, relevant to problems in radiation dosimetry. Employing the concept of finite order transmission and reflection functions recurrence relations were obtained which introduce simplicity in the numerical calculations. Author

N72-24733# Maryland Univ., College Park. Center for Theoretical Physics.
COULOMB DISSOCIATION OF RELATIVISTIC NUCLEI
X. Artru and G. B. Yodh Mar. 1972 14 p refs
(Grant NSF GU-2061)
(TR-72-094) Avail: NTIS HC $3.00

The process of Coulomb dissociation of a high energy (relativistic) nucleus in the field of a heavy nucleus is considered. For C and O in tungsten at 10 GeV/nucleon, it is shown that an

effect of about 10% of the total inelastic cross section exists. The behavior of the cross section at the high energy limit is also considered. Author

N72-24734# Maryland Univ., College Park. Center for Theoretical Physics.
LEPTON NUCLEON SCATTERING SUM RULES FROM TRIPLET QUARK MODEL LIGHT CONE ALGEBRA OF CURRENTS
R. N. Mohapatra and P. H. Weisz Dec. 1971 21 p refs
(Grant NSF GP-8748; NSF GU-2061)
(TR-72-062) Avail: NTIS HC $3.25

Using Fritzsch-Gell-Mann light cone algebra of currents, sum rules and inequalities were derived involving strangeness changing and strangeness conserving scaling functions in neutrino-nucleon and antineutrino-nucleon scattering and in e-N scattering. Some of these are found to depend on the charges of consistent quarks and hence distinguish between various models. Author

N72-24735# Maryland Univ., College Park. Center for Theoretical Physics.
LOW ENERGY THEOREMS AND HIGH ENERGY BEHAVIOR
Michael Creutz Apr. 1972 13 p refs
(Grant NSF GU-2061)
(TR-72-096) Avail: NTIS HC $3.00

Constraints were studied for high energy, which are imposed by analyticity on amplitudes, given a low energy theorem and an upper bound to the amplitude at intermediate energies. These constraints prove to be nontrivial when applied to the pion electromagnetic form factor. Analysis of the contribution of the spin-dependent forward Compton amplitude to unpolarized Compton scattering may employ this study. The application requires experimental data on the forward differential cross section in the resonance region. Author

N72-24736# Maryland Univ., College Park. Center for Theoretical Physics.
EFFECTIVE MASS AND CORRELATION LENGTH OF NUCLEON CONSTITUENTS
Patrizio Vinciarelli Apr. 1972 11 p refs
(Grant NSF GU-2061)
(TR-72-097) Avail: NTIS HC $3.00

Resulting from a field theory model with spontaneous symmetry breaking, a description of hadrons as bound states of quarks is sketched. The values of the energy and virtual photon mass parameters at which scaling of the electroproduction structure functions sets in are related to basic physical quantities. Author

N72-24737# Maryland Univ., College Park. Center for Theoretical Physics.
POSITIVITY, SUBTRACTIONS, AND THE MODULI OF SCATTERING AMPLITUDES
Michael Creutz Mar. 1972 15 p refs
(Grant NSF GU-2061)
(TR-72-090) Avail: NTIS HC $3.00

It is shown that if an amplitude has certain positivity properties (as given by an optical theorem) and if it obeys a dispersion relation with a known number of subtractions, then the amplitude can be uniquely and explicitly found from its modulus on the cuts and a known number of additional parameters. Applying this result to forward polarized Compton scattering, it was determined that the necessary additional parameters are fixed by low energy theorems in terms of the static electromagnetic properties of the target. Author

N72-24738# Pennsylvania Univ., Philadelphia. Towne School of Civil and Mechanical Engineering.
UNIFIED POSITIVE COLUMN THEORY OF GAS DISCHARGES
Ira M. Cohen and Alan M. Whitman May 1972 33 p refs
(Grant NSF GK-2281)
(Rept-2281/6) Avail: NTIS HC $3.75 CSCL 20H

The effects of electron impact ionization, three-body recombination, and a thermal energy balance are considered on the positive column of a gas discharge confined between plane parallel walls. Thermal and electrical conductivities are given by mixture rules that are linear interpolations of collision cross sections. This formulation allows the description of the entire range of gas discharges from dark discharges through arcs. The higher temperature and fractionally ionized plasmas are discussed from the normal glow through the transition to an arc. Calculation was made of ionization collision rate vs. current (per unit depth). Author

N72-24739*# Translation Consultants, Ltd., Arlington, Va.
THE INTERACTION OF IMPURITY ATOMS WITH DISLOCATIONS IN IRON
M. Ye. Blanter and M. S. Blanter Washington NASA May 1972 5 p refs Transl. into ENGLISH from Nauchn. Tr. Vsesoyuznogo Zaochn. Mashinostroitel'nogo Inst. (Moscow), no. 6, 1968 p 216-224
(Contract NASw-2038)
(NASA-TT-F-14298) Avail: NTIS HC $3.00 CSCL 20H

The effect of using heat to release dislocations on the mechanical properties of iron, particularly the yield point, was investigated. Rapid cooling from different temperatures was used to fix the dislocations not locked by impurity atoms. Author

N72-24740# Amiens Univ. (France). Lab. de Physique Theorique.
ENERGY DEPENDANCE OF SYMMETRY BREAKING FOR TWO-BODY PROCESSES
S. Badier Mar. 1972 18 p refs
Avail: NTIS HC $3.00

Failures of symmetry predictions for two-body inelastic processes at high energy are assumed to arise from mass-difference effects in the t-channel. When applied to the quark model, a new prescription for cross-sections comparison is shown to agree fairly well with experiment. Author

N72-24741# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
SOME FEATURES OF DIRECT SUM OF (3,3 BAR) AND (3 BAR, 3) BREAKING OF CHIRAL SYMMETRY
L. Maiani 1 Sep. 1971 25 p refs
(ISS-71/21) Avail: NTIS HC $3.25

Some general properties of the direct sum of (3,3 bar) and (3 bar 3) breaking of chiral direct product of SU (3) and SU (3) are discussed. These include the relations between vacuum breaking and explicit breaking and the elimination of possible ambiguities in the connection of the breaking parameters to experimentally observed quantities. Some recently advanced speculations on the breaking of scale invariance are illustrated. Author

N72-24742# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
HIGH ENERGY SCATTERING OF ELECTRONS FROM NUCLEI
C. Ciofidegliatti 13 Sep. 1971 69 p refs Presented at Nucl. Theory Course, Trieste, Italy, Jan. - Mar. 1971
(ISS-71/23) Avail: NTIS HC $5.50

The basic theory of electron scattering is briefly reviewed. The theoretical interpretations of the latest experimental data on elastic and inelastic scattering are presented and discussed. Particular attention is given to the problems of short range correlations and of single particle momentum distributions and separation energies. Author

N72-24743# Zentralstelle fuer Atomkernenergie-Dokumentation, Frankfurt am Main (West Germany).
BIBLIOGRAPHIES IN NUCLEAR SCIENCE AND TECHNOLOGY. SECTION 12: NUCLEAR SCIENCE LITERATURE OF EASTERN COUNTRIES. NUMBER 23: PLASMAPHYSICS
Benno Ensslen, comp. Sep. 1971 109 p refs In GERMAN and ENGLISH
(AED-C-12-23) Avail: AEC Depository Libraries
This listing contains 1919 references on various aspects of plasma physics. NSA

N72-24744# Oak Ridge National Lab., Tenn. Isotopes Information Center.
EFFECT OF INDIVIDUAL FACTORS ON THE EFFICIENCY OF LUMINESCENT SCREENS FOR NEUTRON RADIOGRAPHY
V. S. Nikishov, A. M. Gurvich, N. D. Tyufyakov, A. S. Shtan, and V. S. Yaskevich [1972] 6 p refs Transl. into ENGLISH from Radiats. Tekh. (Moscow), v. 6, no. 6, 1971 p 58-62
(ORNL-tr-2545) Avail: NTIS
The results of studies on the effects of various factors on the efficiency of ZnS-Ag luminescent screens to be used with X-ray film in neutron radiography are presented. Screen preparation, optimum screen thickness, and the method of introduction and amount of boric acid were studied. NSA

N72-24745# European Atomic Energy Community, Ispra (Italy). Joint Nuclear Research Center.
SOME EXPERIMENTAL RESULTS ON THE SORPTION OF Cs BY SUBMICRON W-10 PERCENT Ta AND Ta POWDERS
G. F. Debeni, O. Gautsch, and G. Hodapp Dec. 1971 24 p refs
(EUR-4740) Avail: AEC Depository Libraries; EUR FF 4.45
Submicron W-10% Ta and Ta powders were loaded with Cs at powder temperatures between 600 and 800 C, and Cs vapor pressures ranging from about 0.01 to 20 mm Hg (sorption-desorption cycles). The Cs saturation loadings were determined by a Cs-134 tracer method and the corresponding equilibrium pressures of the Cs vapor were obtained from the temperature of a liquid Cs reservoir. The pressure-temperature-loading characteristics of the Cs-Ta system showed that the saturation loadings were, at given Cs-pressures, proportional to the oxygen content of the powders, i.e., to the amount of Ta2O5. This oxide probably reacts with Cs to form compounds of the Ta2Cs(x)O5, with x = 2, 4, or 6. Author (NSA)

N72-24746# Kernforschungszentrum, Karlsruhe (West Germany). Lab. fuer Isotopentechnik.
RADIOISOTOPES IN MECHANICAL ENGINEERING
J. Andreas Gerve May 1971 25 p refs Presented at 4th UN Intern. Conf. on the Peaceful Uses of Atomic Energy, Geneva, 6-16 Sep. 1971
(AED-Conf-71-100-55; Conf-710901-539) Avail: AEC Depository Libraries
The use of thin layer activation with heavy loaded particles is discussed, as well as examples of radioisotopic uses in mechanical engineering for simultaneous measurement of thickness and density in thin layers, determination of size and distribution of wear particles, and movement measurements, such as roller speed in a roller bearing. NSA

N72-24747# Battelle-Northwest, Richland, Wash.
DIVISION OF ISOTOPES DEVELOPMENT PROGRAMS Quarterly Report, Aug. - Oct. 1971
J. H. Jarrett, comp. Nov. 1971 45 p refs
(Contract AT(45-1)-1830)
(BNWL-1308-8) Avail: NTIS
Research and development is reported on low cost Cs and Sr sources, large scale uses of fission product Xe, isotope production and uses, neutron radiography using Cf-252, advance source development, circulatory support systems, and nuclear methods for seabed exploration. NSA

N72-24748# Western Environmental Research Lab., Las Vegas, Nev.
OFF-SITE RADIOLOGICAL SURVEILLANCE, NIMBUS B-2/SNAP-19 LAUNCH, APRIL 13, 1969
Dec. 1971 9 p refs Sponsored by AEC
(SWRHL-71-r) Avail: NTIS
Off-site surveillance was conducted for the successful launch of the Nimbus 2/SNAP 19 weather spacecraft on 13 April 1969. Environmental monitoring and samples taken before and after the launch indicated no release of radioactivity. Author (NSA)

N72-24749# Los Alamos Scientific Lab., N.Mex.
SURVEY OF RADIOGRAPHIC IMAGE ENHANCEMENT EXPERIENCE
B. R. Hunt, D. H. Janney, and R. K. Zeigler [1971] 21 p refs Presented at the Am. Soc. for Nondestructive Testing, Los Angeles, 13 Mar. 1972 Sponsored by AEC
(LA-DC-72-69; Conf-720301-2) Avail: NTIS
The feasibility of enhancing radiographs by digital computer was demonstrated, and a special system to be used for digitizing and reconstructing images was obtained. Experience in the enhancement of radiographs and special problems of radiograph enhancement are discussed. Examples of enhancement are presented, using before-and-after pictures to illustrate the degree of improvement in picture quality. A brief discussion of some of the computing problems in image enhancement is also presented. A brief survey of the characteristics of the new image processing system is given. Author

N72-24750# European Space Research Inst., Frascati (Italy).
HOLTSMARKIS 5/2TH POWER LAW FOR THE WINGS OF STARK-BROADENED HYDROGEN LINES
Hans R. Griem Jan. 1972 11 p refs Submitted for publication
(ESRIN-IN-183) Avail: NTIS HC $3.00
Conditions for the validity of the 5/2 power law for the asymptotic distribution in hydrogen line spectra are discussed. The physical significance of parameters are shown to be the characteristics frequencies for the quasi-static linear Stark effect and for the fluctuations of the perturbing field respectively. The complimentary approximations and the results of relaxation theory are compared for three different cases which are characterized by different values of the dimensionless frequency variable corresponding to the plasma frequency. Author (ESRO)

N72-24751# Rome Univ. (Italy). Inst. of Physics.
HIGH RESOLUTION NONLINEAR SPECTROSCOPY OF MOLECULAR VIBRATIONAL RESONANCES IN GASES
F. DeMartini 22 Nov. 1971 21 p refs Presented at the Symp. on Fundamental and Appl. Laser Phys., Esfahan, Iran, 29 Aug. - 5 Sep. 1971 Sponsored by CNR
(Nota-Interna-345) Avail: NTIS HC $3.25
An account of the theory of the line shape of optically active resonances in gases including the effects of Doppler broadening, Dicke's narrowing, and pressure narrowing is given. Two methods of high resolution nonlinear spectroscopy based on the application of the coherent molecular excitation to the stimulated Raman scattering process are described and applied to the study of the profile of the Q sub 01 (1) vibrational resonance in hydrogen gas. The results of these experiments were compared with the data obtained by spontaneous Raman spectroscopy. It is concluded that although the use of a pressure tune stimulated Raman spectroscopy hydrogen oscillator was of interest from investigation of Q sub 1 (1) resonance of the hydrogen molecule, the use of a tunable dye laser makes possible the application of nonlinear methods to molecular and solid state spectroscopy. Author (ESRO)

N72-24752# Rome Univ. (Italy). Inst. of Physics.
SUFFICIENT CONDITIONS FOR SATURATION OF NUCLEAR FORCES

F. Calogero, Y. A. Simonov (Inst. of Theoret. and Exptl. Phys., Moscow), and E. L. Surkov (Kurchatov Inst. of Atomic Energy) 14 Dec. 1971 50 p refs Sponsored in part by CNEN and Ist. Nazl. di Fis. Nucl.
(Nota-Interna-351) Avail: NTIS HC $4.50

The extension of Wigner's theorem is presented for a static nuclear force having a general exchange character. The treatment requires the use of group theoretical results. A set of saturation conditions is given, having the advantage of being applicable to nuclear interactions characterized by potentials that are different for each isospin state, and which may change sign. A second set of saturation conditions is derived using the technique of Fisher and Ruelle. The two types of sufficient conditions for saturation reported do not completely overlap. Interactions mediated by two-body local static potentials are considered. Author (ESRO)

25 PHYSICS, PLASMA

Includes magnetohydrodynamics. For applications see: 28 Propulsion Systems.

N72-24753* California Univ., Los Angeles.
CONTINUOUS PLASMA LIGHT SOURCE Patent
Willard F. Libby, Carl A. Jensen, and Lowell L. Wood, inventors (to NASA) Issued 2 Nov. 1971 11 p Filed 14 Oct. 1969 Continuation-in-part of abandoned US Patent Appl. SN-479357, filed 12 Aug. 1965 Sponsored by NASA
(NASA-Case-XNP-04167-2; US-Patent-3,617,804; US-Patent-Appl-SN-866442; US-Patent-Class-315-326; US-Patent-Class-315-111; US-Patent-Class-315-358; US-Patent-Class-313-231; US-Patent-Class-313-186; US-Patent-Class-313-212; US-Patent-Class-313-224; US-Patent-Class-331-94.5) Avail: US Patent Office CSCL 20I

A light source apparatus for producing intense monochromatic light from a low temperature plasma is disclosed. The light source apparatus comprises a housing member for confining a gas at subatmospheric pressure, the housing containing output means disposed to transmit light from the confined gas. At least one anode and one cathode are positioned within the gas in electrical circuit relationship with each other. An intense monochromatic light output is achieved by confining the gas in the chamber at a controlled predetermined reduced pressure. An intermediate mode current is drawn from the cathode and produces in the confined gas a region having a high density of metastable atomic states. A low temperature, high density plasma is continuously produced in this region and intense monochromatic light is emitted as a result of the recombination of ions and electrons. Official Gazette of the U.S. Patent Office

N72-24754*# Pennsylvania State Univ., University Park. Dept. of Aerospace Engineering.
AN INVESTIGATION OF TRANSIENT PRESSURES AND PLASMA PROPERTIES IN A PINCHED PLASMA COLUMN M.S. Thesis
Elmer K. Stover and T. M. York Aug. 1971 100 p refs
(Grant NGL-39-009-015)
(NASA-CR-126660; PSU-AERSP-71-4) Avail: NTIS HC $7.00 CSCL 20I

The transient pinched plasma column generated in a linear Z-pinch was studied experimentally and analytically. The plasma column was investigated experimentally with several plasma diagnostics; they were: a rapid response pressure transducer, a magnetic field probe, a voltage probe, and discharge luminosity. Axial pressure profiles on the discharge chamber axis were used to identify three characteristic regions of plasma column behavior: (1) strong axial pressure asymmetry noted early in plasma column lifetime, (2) followed by plasma heating in which there is a rapid rise in static pressure, and (3) a slight decrease static pressure before plasma column breakup. Plasma column lifetime was approximately 5 microseconds. The axial pressure asymmetry was attributed to nonsimultaneous pinching of the imploding current sheet along the discharge chamber axis. The rapid heating could be attributed in part to viscous effects introduced by radial gradients in the axial streaming velocity. Author

N72-24755*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE EFFECT OF WALL FRICTION ON MAGNETOHYDRODYNAMIC GENERATOR PERFORMANCE
Allan R. Bishop Washington May 1972 21 p refs
(NASA-TN-D-6804; E-6436) Avail: NTIS HC $3.00 CSCL 20I

The effect of wall friction on magnetohydrodynamic generator performance is determined by introduction of a wall friction factor into the one-dimensional generator equations. This addition should be useful in improving generator analysis and determining optimum generator geometry. The curves presented can be used to determine the effects of changes in wall friction and generator performance. Wall friction has an increasing effect on the Mach number increases and a decreasing effect as the pressure drop across the generator increase. Author

N72-24756*# Techtran Corp., Glen Burnie, Md.
STUDIES OF PLASMA TURBULENCE BY MEANS OF CHARGED PARTICLE BEAMS
V. S. Koydan, A. G. Ronomarenko, A. I. Rogozin, and V. D. Ryutov Washington NASA May 1972 19 p refs Transl. into ENGLISH FROM "Issledovane turbulentnosti Plazmy s Pomoshchyu Puchka Zaryazhyennykh Chastits", Acad. of Sci. USSR, Novosibirsk, 1971 p 3-22
(Contract NASw-2037)
(NASA-TT-F-13948) Avail: NTIS HC $3.00 CSCL 20I

Calculations were carried out on the interaction of a beam of charged particles with the turbulent oscillations of a plasma. It was found that for given conditions, there may be observed both spatial broadening and spread of the particles of the beam longitudinally according to energy after passage through the turbulent plasma. A relationship was obtained that links the energy density of the turbulent oscillations with the amount of beam broadening and its energy dispersal. An experiment is described for probing the turbulent plasma of a direct discharge with a 50-kV proton beam. The radial broadening of the beam is detected as that associated with ion beam scattering by turbulent plasma oscillations. The amount of beam broadening was determined by the energy density of the oscillating plasma. The possibility of applying this method to the investigation of a turbulent plasma is discussed. Author

N72-24757# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Inst. fuer Energiewandlung und Elektrische Antriebe.
INFLUENCE OF REABSORPTION OF THE RESONANCE LINES ON THE INTENSITY RATIO OF A HELIUM II AND HELIUM I LINE
R. Koehne 1972 42 p refs In GERMAN; ENGLISH summary
(DLR-FB-72-04) Avail: NTIS HC $4.25; DFVLR, 505 Porz-Wahn, Linder Hoehe: DM 13,10

Spectroscopic measurements of electron density and temperature were carried out on an inductively generated, transient helium and argon plasma, with small amounts of helium as a temperature indicator. In calculating the temperature from the ratio of helium line intensities of the various ionization stages, the different reabsorptions of the Lyman resonance series which depend on the population densities in the corresponding states must be considered. For electron densities of about 10 to the 16th power/cu cm, electron temperatures between 50,000 and 60,000 K were measured. Author

N72-24758# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France).
MEASUREMENT OF THE ELECTRON DENSITY OF A PLASMA IN A TOKAMAK-FAR REACTOR (TFR) USING A MICROWAVE INTERFEROMETER
Jean-Pierre Crenn Aug. 1971 36 p In FRENCH; ENGLISH

summary Sponsored by EURATOM
(EUR-CEA-FC-608) Avail: AEC Depository Libraries

Three types of interferometers were envisaged for measuring the electron density of a plasma in a Tokamak-Far reactor: a single channel interferometer with a mirror rotating at high speed, a multichannel interferometer with Fabry-Perot cavities, and a multichannel interferometer with electronic equipment allowing a zebra-strip display of the interference fringes. This last device proved to be the most suitable Its principal characteristics (working wavelength, number of channels, and electronics) are presented. NSA

N72-24759# Institut Atomnoi Energii, Moscow (USSR).
SEVERAL PROBLEMS IN MEASURING ION TEMPERATURES IN A TOKAMAK DEVICE
D. A. Sheglov 1970 16 p refs In RUSSIAN
(IAE-2041) Avail: AEC Depository Libraries

Problems connected with the calculation of spatial distribution of ion temperature and certain other plasma parameters are examined. Calculated profiles of spectral lines and theoretical charge exchange spectra of neutral atoms are given for various types of ion temperature distribution. Results were obtained on the TM-3 device during simultaneous measurement of ion temperature by different methods. Neutral atom spectra were computed in the presence of absorption in the plasma. Limiting ion temperatures were evaluated for Joule heating in the case where ion energy loss is connected only with charge exchange, and the length of free flight of an atom is small in comparison with plasma dimensions. Author (NSA)

N72-24760# Institut fuer Plasmaphysik G.m.b.H., Garching (West Germany).
PROPOSAL OF A NEW SCHEME USING EXTREME FORWARD LIGHT SCATTERING FOR ION TEMPERATURE MEASUREMENT IN STELLARATOR AND TOKAMAK PLASMAS
A. Gondhalekar and F. Keilmann Aug. 1971 35 p refs
(IPP-2/202; IPP-4/26) Avail: AEC Depository Libraries

Thomson scattering measurements were made at an angle of less than one degree. Using a CO2 laser at lambda sub zero = 10.6 micron ensures that alpha sub e greater than 1 in a stellarator or tokamak-type plasma. The scattered spectrum is then characteristic of the motion of the ions, and the ion temperature can be deduced from its width. Spectral resolution of the scattered light in the presence of direct light is made possible through a coherent photomixing receiver. Artificially enhanced false light serves as local oscillator radiation for the homodyne detection. A setup for measuring ion temperatures up to 1 keV at plasma densities down to 10 to the 12th power/cu cm is described. Author (NSA)

N72-24761# Academy of Sciences (USSR), Leningrad.
MICROWAVE PLASMA HEATING EXPERIMENTS IN TUMAN-2 DEVICE
V. E. Golant, M. G. Kaganskii, L. P. Pakhomov, K. A. Podushnikova, and K. G. Shakhovets 1971 26 p refs In RUSSIAN; ENGLISH summary
(NP-19160) Avail: AEC Depository Libraries

Microwave plasma heating experiments were carried out in the toroidal magnetic trap at the upper hybrid frequency range. At plasma concentration (1 to 3) X 10 to the 12th power/cu cm, wave frequency of 9 GHz, and power of 80 kW, the microwave input efficiency determined from plasma parameter change runs up to dozen of percent. At concentration (1 to 2) X 10 to the 13th power/cu cm and microwave frequency of 34 GHz, the energy input efficiency was 5 to 10%. The efficiency difference may be caused by the influence of an evanescent region, as the wave lengths were less than the chamber dimension.
Author (NSA)

N72-24762# Commissariat a l'Energie Atomique, Limeil (France). Centre d'Etudes.
NUCLEAR FUSION REACTIONS IN LASER PRODUCED PLASMAS
Jean-Louis Bobin and Francis Floux Dec. 1971 34 p refs In FRENCH
(CEA-R-4255) Avail: AEC Depository Libraries

Neutron emissions were observed in experiments on laser interaction with matter. When the laser pulse is not too short, photon absorption and matter heating take place in hydrodynamic conditions. The temperatures obtained increase with the flux. In experiments performed with a laser beam of a few gigawatts and in hydrodynamic conditions during the interaction with a solid deuterium target, nuclear fusion reactions were observed.
Author (NSA)

N72-24763# Princeton Univ., N.J. Plasma Physics Lab.
DYNAMIC STABILIZATION OF TRANSVERSE KELVIN-HELMHOLTZ INSTABILITY
Y. C. Lee and T. K. Chu 1971 6 p refs Presented at 3d Intern. Conf. on Quiescent Plasmas, Elsinore, Denmark, 20 Sep. 1971
(Contract AT(30-1)-1238)
(Conf-710929-7) Avail: NTIS

The transverse Kelvin-Helmholtz instability is driven by non-uniform E x B motion of a plasma. An ac electric fizld near the ion cyclotron frequency, applied across the shear layer resulting from the nonuniform dc electric field, can be used to stabilize the transverse Kelvin-Helmholtz instability. The stabilizing effect is shown to arise from high frequency excursion of ions near the shear layer. Author (NSA)

N72-24764# Sandia Labs., Albuquerque, N.Mex.
INJECTION OF A RELATIVISTIC ELECTRON BEAM INTO A PLASMA
S. E. Rosinskii and A. A. Rukhadze Jan. 1972 19 p refs Transl. into ENGLISH of Russian report Presented at Conf. on Plasma Theory, Kiev, 19-23 Oct. 1971 Sponsored by AEC
(SC-T-722456; Conf-711016-7) Avail: NTIS

The fields and currents induced in a dense plasma due to the injection of a relativistic electron beam were investigated. It is shown that, during a time less than the collision time of the plasma electrons, the induced fields and currents represent a superposition of fields and currents accompanying the beam (static in the rest system of the beam) and transition fields and currents essentially caused by the beginning of the injection process and vanishing in the course of a time greater than the collision time of the electrons. The nature and magnitude of this transition radiation were evaluated. It is shown, in particular, that transition fields are almost potential in nature; the magnetic field is small in comparison with the electric field. The problem is solved in two formulations: (1) injection of a beam with finite time tau, and (2) injection of a beam with a finite interval of space between points z = 0 and z = 1 sub 0. Author (NSA)

N72-24765# California Univ., Los Angeles.
TASK 2: PLASMA CONTROL Progress Report, 1 Apr. - 1 Oct. 1971
Francis F. Chen 1 Oct. 1971 6 p ref
(Contract AT(04-3)-34)
(UCLA-34-P-157-X1) Avail: NTIS

Research developments are reported on five pieces of equipment: (1) high current arc, (2) dc HCN laser, (3) pulsed HCN laser, (4) CO2 lasers, and (5) large arcs. The status and preliminary results from each are discussed. NSA

N72-24766# Mobil Research and Development Corp., Princeton, N.J. Nuclear Research Group.
ION BEAM PROBE FOR ST TOKAMAK Final Report
Robert L. Hickok and Forrest C. Jobes Feb. 1972 114 p refs
(Contract F44620-69-C-0049; AF Proj. 9752)
(AD-737561; AFOSR-72-0018TR; SR-6) Avail: NTIS CSCL 20/9

The design, construction and operation of a heavy ion beam probe for measuring plasma density, space potential and current

density on the ST Tokamak is described. The beam probe utilizes a 200 keV, 20 Micro amp., T1(-)ion beam and provides three dimensional space resolution of the order of 0.1 cc, time resolution of the order of 0.0001 sec, simultaneous measurements of all three plasma parameters and information that is continuous in both space and time. Preliminary results show good clean signals for all three quantities with signal to noise ratio of the order of 100 to 1. The results establish that there are density fluctuations in the ST plasma that are localized to finite radial positions. The preliminary results also indicate that the space potential goes negative towards the center of the plasma. More work remains in order to obtain quantitative interpretations of the current density signals and to increase the operating range of the beam probe system. Author (GRA)

N72-24767# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
ANALYSIS OF MHD FLOW AND HEAT TRANSFER IN LAMINAR PIPE FLOW IN A RADIAL MAGNETIC FIELD
F. L. Fuller Feb. 1972 36 p refs
(AD-737727; RE-420) Avail: NTIS CSCL 20/9

A solution is obtained for the fully-developed pipe flow problem for a conducting liquid in a radial magnetic field. The resulting velocity profiles and friction factors are valid over a large range of Hartmann numbers. Based on the new solutions for velocity, the energy equation, including the viscous and ohmic dissipation terms, is solved. Nusselt number is obtained as a function of Hartmann number and dimensionless temperature profiles are presented as a function of Hartmann number and a parameter dependent upon the ratio of ohmic heating to wall heat transfer. Large magnetic influence on the temperature profiles is shown to be possible. Author (GRA)

N72-24768# Illinois Univ., Urbana. Coordinated Science Lab.
THE EXPERIMENTAL STUDY OF WAVE-WAVE COUPLING PROCESSES IN A BEAM PLASMA SYSTEM Ph.D. Thesis
James Shih-Tsih Chang Jan. 1972 96 p refs
(Contract DAAB07-67-C-0199)
(AD-737529; R-549; UILU-ENG-72-2208) Avail: NTIS CSCL 20/9

The wave-wave coupling processes in a cold-beam cold-plasma system have been investigated under conditions such that nonlinear wave-particle effects are negligible. In this experiment a low density monoenergetic beam in the energy range of 15 to 16 keV was premodulated at two frequencies, f(0) = 9.5 GHz and f(1) = 9.4 GHz and injected into the afterglow of a discharge in neon. The interaction between these two launched waves and their difference frequency, f(2), was investigated and at low wave amplitudes was found to be in general agreement with the theory of the three-wave decay instability. At larger wave amplitudes, a strong remixing of the three waves occurred which gave rise to satellite waves at frequencies f(0) plus or minus nf(2) and f(1) plus or minus nf(2) where n is an integer. Measurements of the spatial evolution of these satellite waves and their dependence on the modulation power and difference frequency are presented. The results are discussed in the light of the theory of coupling among spatially growing waves. Author (GRA)

N72-24769# Naval Research Lab., Washington, D.C.
ANOMALOUS RESISTANCE DUE TO CROSS FIELD ELECTRON-ION STREAMING INSTABILITIES
Martin Lampe, Wallace M. Manheimer, John B. McBride, and Joseph H. Orens Feb. 1972 28 p refs
(AD-738428; NRL-MR-2395) Avail: NTIS CSCL 20/9

New computer simulations show that the non-linear stage of the beam cyclotron instability is stabilized if T sub i/T sub e equals or approximately equals v sub d/v sub e, similarly to ion sound, as has been predicted theoretically. In this case, the instability makes no significant contribution to anomalous resistance, for the conditions of typical laboratory resistive shocks. In the opposite case, a theoretical study of the later development shows that after the onset of ion trapping, both wave energy and electron temperature grow linearly with time, and the anomalous electron-ion collision frequency becomes constant at about 0.02 times the electron plasma frequency. These conclusions are supported by simulation studies. Author (GRA)

N72-24770# California Inst. of Tech., Pasadena. Antenna Lab.
PLASMA INVERSE SCATTERING THEORY
G. N. Balanis Dec. 1971 96 p refs
(Grant AF-AFOSR-1935-70; AF Proj. 9768)
(AD-737518; AFOSR-72-0184tr; TR-62) Avail: NTIS CSCL 20/9

The object of the report is to calculate the electron density profile of plane stratified inhomogeneous plasmas. The electron density profile is obtained through a numerical solution of the inverse scattering algorithm. The inverse scattering algorithm connects the time dependent reflected field resulting from a delta-function field incident normally on the plasma to the inhomogeneous plasma density. Examples show that the method produces uniquely the electron density on or behind maxima of the plasma frequency. It is shown that the delta-function incident field used in the inverse scattering algorithm can be replaced by a thin square pulse. Author (GRA)

N72-24771# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EFFECT OF A MAGNETIC FIELD ON THE HEAT EXCHANGE OF A BINGHAM LIQUID
V. A. Kartsev and B. B. Sviklis 12 Nov. 1971 15 p refs Transl. into ENGLISH from Izv. Akad. Nauk Latv. SSR, Ser. Fiz. i Tekhn. Nauk (Riga), no. 6, 1969 p 90-96
(AF Proj. 3145)
(AD-738246; FTD-MT-24-94-71) Avail: NTIS CSCL 20/9

It is shown that heat exchange is considered at plane laminar magnetohydrodynamic flow of the Bingham liquid in a channel with nonconductive walls. Solution of the energy equation is obtained for completely developed flow at short circuit and no load operation of the channel. The dependence of the Nu criterion on Hartmann's number is analyzed at different values of the quasi solid zone width of the flow and at thermal load on the channel walls with and without considering the Joulean and the visco plastic dissipation. Author (GRA)

N72-24772# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EXPERIMENTAL STUDY OF SHOCK WAVE GENERATION IN THE CASE OF PULSED BREAKDOWN OF FLUID
G. Ya. Umarov and V. S. Trukhov 19 Nov. 1971 13 p refs Transl. into ENGLISH from Izv. Akad. Nauk Uz. SSR, Ser. Fiz.-Mat. Nauk (Tashkent), no. 3, 1964 p 56-60
(AD-737883; FTD-MT-24-786-71) Avail: NTIS CSCL 20/9

In the initial stage of expansion of a spark channel in liquid, the development of instabilities in the channel plasma is observed. These are accompanied by the emergence of a series of shock waves in the liquid. The powerful shock wave which is observed during the pulsed breakdown of a liquid is formed from the series of shock waves in the zone of formation of the shock front. The pulsed breakdown of liquid and study of the dynamics of formation of the secondary shock waves apparently can serve as a sensitive and convenient method for simulation and clarification of the nature of some forms of plasma instabilities. Author (GRA)

N72-24773# New York Univ., N.Y. Dept. of Electrical Engineering.
MICROWAVE SCATTERING FROM UNDERDENSE AND OVERDENSE TURBULENT PLASMAS
D. Attwood 1971 9 p refs
(Contract N00014-67-A-0467-0018)
(AD-737655; Memo-M-11) Avail: NTIS CSCL 20/9

Experimental results of microwave scattering from a turbulent plasma are presented. As electron density is increased beyond

the critical value, a transfer from volume to surface scattering is observed. Overdense scattering is characteristic of a cylinder displaying orientation fluctuations. Author (GRA)

N72-24774# Technische Hochschule Darmstadt (West Germany). Lehrstuhl fuer Angewandte Physik.
TIME RESOLVED SPECTRAL OPACITY PROFILES AND ABSORPTION COEFFICIENTS IN NANOSECOND SPARK CHANNELS *Interim Report*
W. Gemmer, H. Gerke, K. Braun, and H. Fischer Mar. 1971 28 p refs
(Contract F61052-68-C-0039; AF Proj. 8679-02)
(AD-737842; AFCRL-71-0490; SR-7) Avail: NTIS CSCL 20/9

Time resolved spectral opacities were observed in high density nanosecond spark channels by application of Meiners' method. The spark channel was backimaged into its origins by means of a surface mirror which reflected in separated parallel strips only. Thus, the reflected light penetrated the channel in zones parallel to its axis. In case of cylindrical symmetry, the absorption coefficient profile from the axis to its periphery can be calculated from the ratio of the spectral emissivity with and without reflection. In addition, the profile relative emission coefficient, the relative temperature, and the optical density profile can be determined. The described method worked well in air but not in argon or helium because split channels and a new type of nanosecond instability was observed in these gases.
Author

N72-24775# *Air Force Systems Command, Wright-Patterson* AFB, Ohio. Foreign Technology Div.
METHODS OF SHORTENING THE DURATION OF LIGHT FLASHES EMITTED BY SPARK DISCHARGE
S. I. Andreev, M. P. Vanyukov, and E. V. Daniel 22 Nov. 1971 10 p refs Transl. into ENGLISH from Usp. Nauch. Fotogr. (USSR), v. 9, 1964 p 147-150
(AD-738389; FTD-MT-24-798-71) Avail: NTIS CSCL 20/9

The article deals with the shortening of the duration of light flashes in nitrogen, argon, and air. Author (GRA)

N72-24776# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DYNAMICS OF THE PLASMA FORMATION OF A SPARK CHANNEL OF ELECTRICAL DISCHARGE IN A LIQUID
G. Ya. Umarov and V. S. Trukhov 19 Nov. 1971 10 p refs Transl. into ENGLISH from Dokl. Akad. Nauk Uz. SSR (Tashkent), no. 4, 1969 p 15-17
(FTD Proj. 7JJ)
(AD-738387; FTD-MT-24-785-71) Avail: NTIS CSCL 20/9

The article very briefly presents a mathematical description of the dynamics of plasma formation of a spark channel of electrical discharge in a fluid. Author (GRA)

26 PHYSICS, SOLID-STATE

Includes semiconductor theory; and superconductivity. For applications see: 16 Masers. For related information see also: 10 Electronics.

N72-24777*# Scientific Translation Service, Santa Barbara, Calif.
SEMICONDUCTOR DETECTORS OF RADIATION AND THEIR APPLICATION IN DEEP SPACE STUDIES
A. Lipinski and W. Mycielski Washington NASA May 1972 10 p refs Transl. into ENGLISH from Postepy Astronautyki (Poland), no. 3, 1968 p 15-23
(Contract NASw-2035)
(NASA-TT-F-14261) Avail: NTIS HC $3.00 CSCL 20L

The application of semiconducting detectors to the investigation of deep space is discussed. Ways of connecting the detectors with other devices are shown and schematics of transistor amplifier sets are given, which are used with the detectors. The effect of large radiation doses on the functioning of semiconducting detectors is also considered. Author

N72-24778# *Joint Publications Research Service, Arlington, Va.*
MOTION OF MACROSCOPIC INCLUSIONS IN SOLIDS
Ya. Ye. Geguzin and M. A. Krivoglaz 9 May 1972 48 p *Transl. into ENGLISH from the book "Dvizheniye Makroskopicheskikh Vklyucheniy v Tverdykh Telakh"* Moscow, Metallurgy Publishing House, 21 Apr. 1971
(JPRS-55930) Avail: NTIS HC $4.50

A review is presented of theoretical and experimental studies on the diffusion migration of inclusions in solids. Single-component and two-component solids are considered. The effect of motion of inclusions on high temperature processes in solids is also discussed. K.P.D.

N72-24779*# National Bureau of Standards, Washington, D.C. Electronic Techology Div.
METHODS OF MEASUREMENT FOR SEMICONDUCTOR MATERIALS, PROCESS CONTROL, AND DEVICES Quarterly Report, 1 Jul. - 30 Sep. 1971
W. Murray Bullis, ed. Apr. 1972 55 p Sponsored jointly by DNA, Navy Strategic Systems Proj. Office, Navy Electron. Systems Command, AFWL, AFCRL, ARPA, AEC, and NASA
(NASA-CR-126647; NBS-TN-717) Avail: NTIS; SOD $0.55 as C 13.46:717 CSCL 20L

Activities directed toward the development of methods of measurement for semiconductor materials, process control, and dzvices are described. Topics investigated include: measurements of transistor delay time; application of the infrared response technique to the study of radiation-damaged, lithium-drifted silicon detectors; and identification of a condition that minimizes wire flexure and reduces the failure rate of wire bonds in transistors and integrated circuits under slow thermal cycling conditions. Supplementary data concerning staff, standards committee activities, technical services, and publications are included as appendixes. Author

N72-24780# National Defense Research Organization TNO, Rijswijk (Netherlands).
THE EFFECT OF GASES ON THE CONDUCTIVE PROPERTIES OF ORGANIC SEMICONDUCTORS. 2: RESULTS FOR PHTHALOCYANINE AND QUARTZ SUBSTRATE
Th. G. J. vanOirschot, D. vanLeeuwen, and J. Medema Jun. 1971 15 p refs
(CL-1971-17; TDCK-58753) Avail: NTIS HC $3.00

Data on semiconduction activation energies and photoconductive properties of phthalocyanine are presented. Special attention was paid to the effect of adsorbed ammonia on the ratio of the photo- and dark conductivity. The conductivity changes of the quartz substrate in the presence of gases, such as H2O vapor were measured. Author

N72-24781# National Defense Research Organization TNO, Rijswijk (Netherlands).
THE EFFECT OF GASES ON THE CONDUCTIVE PROPERTIES OF ORGANIC SEMICONDUCTORS. 3: BETA CAROTENE
Th. G. J. vanOirschot, D. VanLeeuwen, and J. Medema Jun. 1971 18 p refs
(CL-1971-21; TDCK-58886) Avail: NTIS HC $3.00

The influence of gases on the surface-dark-conductivity of beta carotene was measured. Like in the case of phthalocyanine it was found that the conductivity depends strongly on the type of gas brought into contact with the sample. Pronounced effects (conductivity changes by factors 10,000) were registered for SO2, NH3 and NO2 whereas O2, H2S, CO and Cl2 gave only small responses (by factors smaller that 100). Also water vapor had a large effect in this case. The results for beta carotene are

compared with those obtained for phtalocyanine. The large differences between the sensitivity toward chlorine and sulphur dioxide are of particular interest Author

N72-24782# Weapons Research Establishment, Salisbury (Australia).
THE COMPUTED PERFORMANCE OF THIN FILM FILTERS AT OBLIQUE INCIDENCE
M. S. Brown Feb. 1972 25 p refs
(WRE-TN-571(AP)) Avail: NTIS HC $3.25

A FORTRAN 4 computer program is described, which was written to analyse the performance of multilayer thin film systems. The program was designed to evaluate both absorbing and nonabsorbing films and can compute their performance over a range of incidence angles and wavelengths. The results obtained with the program are compared with measured performance curves for some manufactured filters, and the polarization effects which the filters exhibit are discussed.
Author

N72-24783# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
SURFACE EXCITATIONS OF TYPE 1 SUPERCONDUCTORS IN A STATIC MAGNETIC FIELD
A. Rogani and E. Tabet 28 Jul. 1971 25 p refs
(ISS-71/19) Avail: NTIS HC $3.25

Surface excitations of type-1 superconductors in a static magentic field were studied, assuming diffuse scattering at the superconductor surface. The energy spectrum and the density of states for these excitations were obtained using the self-consistent field approach. Some remarks are made about the relevance of the surface states for the microwave impedance evaluation.
Author

N72-24784# Texas A&M Research Foundation, College Station.
CHARACTERIZATION OF CONDUCTION PROCESSES IN AMORPHOUS SEMICONDUCTORS Semiannual Technical Report
J. L. Stone 1971 53 p refs
(Grant DA-ARO(D)31-124-G134; ARPA Order 1562)
(AD-737514; SATR-2) Avail: NTIS CSCL 20/12

The report describes work carried out during the second six month period under the grant. Emphasis during this period was a furthering of the theory of the photodielectric effect, theoretical development for a continuous distribution of traps and its effect on the thermally stimulated conductivity, construction of experimental apparatus for the thermally stimulated conductivity tests, and the initiation of studies regarding Hall effect in insulating materials. Author (GRA)

N72-24785# Brookhaven National Lab., Upton, N.Y.
ON THE QUESTION OF RF JOINTS IN SUPERCONDUCTING DEFLECTORS
H. Hahn and D. M. Lazarus 5 Jan. 1972 10 p refs
Sponsored by AEC
(BNL-16437) Avail: NTIS

The effects of fabrication tolerances on RF joints in superconducting deflectors for beam separators are analyzed by using an equivalent circuit description. It is found that pretuning of the deflectors eliminates the joint problem. Author (NSA)

N72-24786# Washington Univ., Seattle. Coll. of Engineering.
STUDY OF PHASE TRANSFORMATIONS AND SUPERCONDUCTIVITY Annual Progress Report
Douglas H. Polonis 15 Oct. 1971 60 p refs
(Contract AT(45-1)-2225)
(RLO-2225-T-13-9) Avail: NTIS

The control of transformation phenomena that could lead to wide variations in the physical and mechanical properties of alloys based on titanium and zirconium were studied. The effects of alloy constitution on the superconducting behavior of Ti and Zr alloys were studied and coordinated with the investigation of microstructure and mechanical properties. Results of transformation studies conducted provide a potential basis for the improvement of both the mechanical properties and the superconducting characteristics. It was found that aging of the beta phase in quenched alloys at temperatures above the range for omega stability lead to a phase separation reaction that precedes the nucleation of the alpha phase. Two beta phases form as the result of this reaction, one is rich in solute, termed beta sub 1, while the other is solute-lean and termed beta sub 2. A combination of successive aging and reversion treatments establishes solute-lean and solute-rich regions also termed beta sub 1 and beta sub 2 with the microstructural distribution of the solute-lean regions being determined by the particle distribution of the omega phase formed during the prior aging part of the cycle. Author (NSA)

N72-24787# Illinois Univ., Urbana.
THERMAL VACANCIES AND THERMAL EXPANSION
W. E. Schoknecht and R. O. Simmons [1971] 15 p refs Presented at the 3d Thermal Expansion Symp., Corning, N. Y., 27 Oct. 1971
(Contract AT(11-1)-1198)
(COO-1198-867; Conf-711033-2) Avail: NTIS

The results are reported of a study to determine the contribution of thermally generated vacancies to various thermodynamic properties for neon, argon, krypton, aluminum, lead, copper, silver, and gold. Critical evaluation of data in the literature is required. It is shown, for the solids investigated, that among the ordinary thermodynamic properties, the one most sensitive to the presence of thermal vacancies is the coefficient of thermal expansion. Heuristic justification is thus obtained for the use of thermal expansion methods (in preference to other methods) for determining the properties of this type of thermal defect. Comparisons are also made with published analyses by other authors. Author

N72-24788# Institut fuer Plasmaphysik G.m.b.H., Garching (West Germany).
SUPERCONDUCTING DC POWER SOURCE
W. Kafka Sep. 1971 26 p refs In GERMAN
(IPP-4/90) Avail: AEC Depository Libraries

A superconducting dc power source for superconducting coils is described, and its losses are compared with those of dc sources working at room temperature. It consists of a stationary superconducting winding and a rotating-field magnet. The commutator usually needed in dc machines is replaced by power cryotrons controlled by the rotating field. Commutation losses are largely avoided by the use of switch chokes. The device works at very low frequencies, so hard superconductors can be used. Economy of operation is governed by the losses occurring at low temperature. Losses due to hysteresis, self-field hysteresis, and eddy currents can be kept sufficiently low by using finely subdivided, interlaced filament conductors. Cryotron losses can be reduced by means of longer cryotron conducts and appropriate superconductor material. Formulas for calculating the losses and the most important machine data are given. Calculations are made for a machine with 20 kA, 0.5 V, and 10 kW as examples. Author (NSA)

N72-24789# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
DISTORTION OF INTENSE OPTICAL PULSES IN NONLINEAR MATERIALS Ph.D. Thesis - Paris Univ., Orsay [DISTORSIONS DES IMPULSIONS OPTIQUES INTENSES DANS LES MATERIAUX NON-LINEAIRES]
Jean-Pierre Taran 1971 70 p refs In FRENCH; ENGLISH summary
(ONERA-P-138) Avail: NTIS HC $5.50

The spectral broadening associated with intense optical pulses propagating through Kerr liquids and electro-optical crystals was studied. Kerr liquids perturb the propagation through a directly induced refractive index change; while

electro-optic crystals lead to a two-step process whereby a rectified electric field is first generated, which reacts back onto the optical pulse via the Pockel effects. Typical computed spectra in the case of the Kerr effect are similar to observed spectra of small-scale self-trapped filaments (brilliant traces observed in the Kerr liquids) in CS2 and other Kerr liquids. Comparisqn of experimental results wath theoretical calculations yields information on filament duration, their propagation distance, and molecular processes. Similar spectral spreads should be produced in electro-optic crystals. A brief extension of the approach to the case of mismatched second harmonic generation is outlined.
Author (ESRO)

N72-24790# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
ELECTRONIC STRUCTURE AND MAGNETIC PROPERTIES OF TRANSITION METAL DIBORIDES Ph.D. Thesis - Paris Univ., Orsay [STRUCTURE ELECTRONIQUE ET PROPRIETES MAGNETIQUES DES DIBORURES DES METAUX DE TRANSITION]
Jacques Castaing 1971 63 p refs In FRENCH; ENGLISH summary
(ONERA-P-140) Avail: NTIS HC $5.25

Measurements of specific heat, magnetic susceptiblity, and nuclear magnetic resonance of the first series transition metal-diborides show that their physical properties are similar to those of the pure metal and indicate a d-electron character at Fermi level. From ScB2 to MnB2, the compounds are isomorphous. These results and an associated integral calculation led to a rough band structure model. Chromium diboride shows anomalous properties; this compound which is antiferromagnetic below 85 K has very high specific heat. Heat capacity measurements on V(1-x)CrxB2 and on Mo(1-x)CrxB2 show a sharp maximum of the specific heat for x approximately 0.75, correlated with the onset of long-range antiferromagnetic ordering. This suggests a model with persistent spin fluctuations in the vicinity of an antiferromagnetic state. Author (ESRO)

N72-24791# Institut Franco-Allemand de Recherches, St. Louis (France).
POSSIBLE USE OF FLASH RADIOGRAPHY FOR CRYSTALLOGRAPHIC STUDIES [SUR LES POSSIBILITES D'APPLICATION DE LA RADIOGRAPHIE-ECLAIR AUX ETUDES CRISTALLOGRAPHIQUES]
F. Jamet 1 Sep. 1970 43 p refs In FRENCH
(ISL-11/70) Avail: NTIS HC $4.25

Conditions for obtaining a radiocrystallographic diagram by means of X-ray pulses were studied. Emphasis was given to the Laue transmission diagram which was obtained by an X-ray pulse with a duration of 300 nanoseconds and using a high sensitivity photographic film. An application to fast vaporization of an aluminum single crystal by the exploding wire method is shown. Application of the Bragg law is also tried: monochromatic X radiation is reflected on reticulated plans in a crystal of sodium chloride. The advantage of this method is the relative brightness of the refracted image. Experimental results gained by the powder method are presented. More than one hundred X radiation pulses are necessary for a Debye-Scherer diagram. This method cannot be used for pulse radiography unless a light amplifier is used. Author (ESRO)

N72-24792# Illinois Univ., Urbana. Dept. of Metallurgy and Mining Engineering.
DEFORMATION MECHANISMS IN NOMINALLY BRITTLE MATERIAL Final Report
Howard K. Birnbaum Jan. 1972 6 p
(Contract N00014-67-A-0305-0016)
(AD-736979) Avail: NTIS CSCL 20/12

The plastic deformation of covalently bonded solids at low temperatures (T approximately equal or 0.4 T sub m) and high stresses was investigated using germanium as a test material. The interaction of the dislocations in germanium with the lattice and with a stress wave was studied using internal friction techniques. Author (GRA)

N72-24793# Connecticut Univ., Storrs. Dept. of Physics.
LATTICE THERMAL CONDUCTIVITY OF A NEUTRON-IRRADIATED COPPER-ALUMINUM ALLOY Interim Report
A. J. Friedman, T. K. Chu, P. G. Klemens, and C. A. Reynolds Jan. 1972 29 p refs
(Contract F44620-69-C-0011; AF Proj. 9560)
(AD-737558; UC-PHYS-1-72; AFOSR-72-0238TR) Avail: NTIS CSCL 20/12

Low temperature thermal conductivity results are presented on two Cu (+) 9 at. % Al polycrystals which show that fast-neutron irradiation has two effects on a cold-worked sample of this alloy. In the well-annealed specimen, irradiation produced defects which scatter long wavelength phonons, giving a well-defined 1/(T squared) contribution to the lattice thermal resistivity. Observations by other authors using electron microscopy suggest that the defects are planar vacancy generated dislocation loops 75-100A in diameter. The loop density is calculated from the thermal resistivity, and found to be in reasonable agreement with the electron microscopy results. In the second sample, deformed in tension at room temperature and then annealed at 573K prior to irradiation, the same irradiation treatment produced a contribution to the lattice resistivity which was similar in temperature dependence but larger, by a factor of three, than that produced in the well annealed specimen. A model for this effect is suggested. Author (GRA)

N72-24794# New York Univ., N.Y. Dept. of Physics.
THEORY OF OPTICAL AND OTHER PROPERTIES IN SOLID STATE CRYSTALLINE SYSTEMS Final Report, 1 May 1963 - 15 Jul. 1971
Joseph L. Birman Wright-Patterson AFB, Ohio ARL Nov. 1971 21 p refs
(Contract F33615-68-C-1436; AF Proj. 7885)
(AD-737793; ARL-71-0254; Rept-1504) Avail: NTIS CSCL 20/12

The final report reviews the activities of the solid state theory group of Professor Joseph L. Birman at New York University. Major activities included theory of light scattering, methods and applications of group theory, lattice dynamics theory, and some selected problems on excitons, polaritons, disordered systems, and luminescence. In the recent two years, major successes of the program have included a new explanation of the mechanism of Raman Scattering in II-VI type compounds, and also some major methodological advances in the application of group theory to problems in solid state physics. Author (GRA)

N72-24795# Ohio State Univ. Research Foundation, Columbus.
MAGNETIC PROPERTIES OF THE SOLID HYDROGENS Final Report, 1 Mar. 1967 - 31 Dec. 1971
J. R. Gaines 29 Feb. 1972 12 p refs
(Grant AF-AFOSR-1273-67; AF Proj. 9764)
(AD-737525; AFOSR-72-0469TR) Avail: NTIS CSCL 20/12

Measurements of the magnetic and thermal properties of solid H2, D2, and HD have been performed in the temperature range 4.2K to 0.03K. NMR measurements on solid H2 have been used to determine the crystal field splitting of ortho H2 molecules in para H2. Coherent NMR pulse techniques have been used to obtain and study solid spin echoes in H2 and D2. NMR determination of the anomalous diffusion coefficient of ortho H2 molecules in solid PH2 were attempted. The thermal conductivity of solid H2 samples containing various ortho H2 concentrations below 10% has been measured using the one thermometer-multiheater technique over the temperature range 6K to 1.5K. Author (GRA)

N72-24796# Cornell Univ., Ithaca, N.Y. Dept. of Theoretical and Applied Mechanics.
ON THE PLASTIC DEFORMATIONS OF POLYCRYSTALS
Bruno A. Boley Feb. 1972 16 p refs
(Contract N00014-67-A-0077-0009; NR Proj. 064-40)
(AD-737623; TR-9) Avail: NTIS CSCL 20/12

A derivation is presented, on the basis of considerations of crystalline slip, or the stability conditions in the small for

polycrystal aggregates undergoing plastic deformations.
Author (GRA)

N72-24797# Vanderbilt Univ., Nashville, Tenn. School of Engineering.
STRUCTURAL EFFECTS ON ELECTRICAL PROPERTIES IN AMORPHOUS SEMICONDUCTORS Semiannual Technical Report, 1 Jul. - 31 Dec. 1971
D. L. Kinser and L. K. Wilson 31 Jan. 1972 49 p refs
(Contract DAHC04-70-C-0046; ARPA Order 1562)
(AD-737916; SATR-3) Avail: NTIS CSCL 20/12

During this report period, work has been concentrated on a survey of the structure, electrical and magnetic properties of transition metal oxidephosphate glasses and glasses in the As2Te3-As2Se3 system which possess electrical or magnetic device potential. Examination of a series of FeO-P2O5 glasses has revealed a glass forming range which extends to 80 mole % FeO. Susceptibility and Mossbauer spectroscopy results on these glasses are reported herein. Results on a CuO-P2O5 glass indicate that the conduction mechanism in this system is partially ionic and thermal treatments can change the ionic mechanism to electronic. Detailed studies of the As2Te3-As2Se3 system has shown switching behavior which can be controlled with compositional variation. The compositional variation of the microstructure is noted in micrographs included in the report.
Author (GRA)

N72-24798# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Center.
VISCOSITY AND DENSITY OF THALLIUM SULFIDE (TI2S)
M. N. Abdusalyamova and L. N. Salomakhina 23 Nov. 1971 10 p refs Transl. into ENGLISH from Dokl. Akad. Nauk Tadzh. SSR (Stalinabad), v. 11, no. 7, 1968 p 25-27
(AD-737878; FTD-HT-23-1278-71) Avail: NTIS CSCL 20/12

The kinematic viscosity of fused thallium sulfide was measured at 460-800 degrees by using the Maier-Shvidkovskii method and the density was determined in a quartz pycnometer. The viscosity and density decrease with an increase in the temperature. These data were used to determine the changes in the close order structure of thallium sulfide due to fusion. The structure does not change significantly. Author (GRA)

N72-24799# Litton Systems, Inc., Morris Plains, N.J. Airtron Div.
RESEARCH ON ZIRCON POLARIZERS Quarterly Report, Oct. - Dec. 1971
Roger F. Belt, Richard C. Puttbach, and Robert Uhrin 31 Jan. 1971 32 p refs
(Contract N00014-70-C-0379; NR Proj. 016-403)
(AD-737666; R11-590-6; QR-6) Avail: NTIS CSCL 20/2

Experiments on the growth of zircon (ZrSiO4) were continued using the hydrothermal method. In 1.0 - 1.5 inch diameter autoclaves, a mixed mineralizer consisting of 5m KF-1m LiF was used to produce high quality growth at 570C and 21,400 psi. A 7.5m KF-2m LiF mineralizer produced the best growth rate of 0.002 inch per day per side on (100) seeds. Transparent growth on cm seeds has been produced for the first time. This gives strong evidence that inch size zircon crystals can be obtained hydrothermally. Small hydrothermal runs have been made to evaluate growth under various pressure-temperature-concentration conditions. Attempts to synthesize HfSiO4, a possible substitute for zircon, are described. Plans for a hydrothermal system with pressure-temperature capabilities of 30,000 psi and 700C were completed. The system is now under construction. Author (GRA)

N72-24800# Northern Illinois Univ., Dekalb. Dept. of Physics.
ELECTRICAL AND OPTICAL PROPERTIES OF AMORPHOUS MATERIALS Semiannual Technical Report
Charles Wood 1970 96 p refs
(Grant DA-ARO(D)-31-124-71-G132; ARPA Order 1562)
(AD-738226; SATR-3) Avail: NTIS CSCL 20/12

The more significant developments in the reporting period are the following: Kramers-Kronig analysis of reflectance data has been applied to amorphous and crystalline Sb2Se3 over a wide spectral range from 0 to 35 eV; An accurate procedure has been developed for the computation of optical constants of thin films from reflectance and transmittance data; The scope of materials investigations has been enlarged to include all of the antimony chalcogenides and stoichiometric compounds of single crystal and amorphous Sb2Te3 and Sb2O3 have been prepared and are undergoing investigation. Room-temperature photoconductivity results have been completed. GRA

N72-24218# Israel Program for Scientific Translations, Ltd., Jerusalem.
THE PROBLEM OF LOW TEMPERATURE TECHNIQUES FOR FABRICATION OF THIN DIELECTRIC FILMS
Yu. V. Basikhin, A. D. Sulimin, and A. I. Trubetskoi *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 14-19 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

N72-24219# Israel Program for Scientific Translations, Ltd., Jerusalem.
A REACTOR FOR FABRICATION OF THIN FILMS FROM HETERO-ORGANIC COMPOUNDS
A. A. Savelev, A. D. Sulimin, Yu. V. Basikhin, and A. I. Trubetskoi *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 20-28 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

N72-24220# Israel Program for Scientific Translations, Ltd., Jerusalem.
A REACTOR FOR FABRICATION OF THIN SILICON DIOXIDE FILMS
A. D. Sulimin, A. I. Trubetskoi, and Yu. V. Basikhin *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 29-31 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

N72-24222# Israel Program for Scientific Translations, Ltd., Jerusalem.
LOCALIZATION OF INTERFERENCE BANDS USING A PIM-3 ELECTRO-OPTICAL SYSTEM
V. A. Aradzhioni and N. A. Meshcheryakov *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 37-41 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

N72-24223# Israel Program for Scientific Translations, Ltd., Jerusalem.
INVESTIGATION OF TRANSIENT THERMAL PROCESSES IN THIN FILM MICROCIRCUITS
Yu. A. Nevskii and V. A. Aradzhioni *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 42-48 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

N72-24239# Israel Program for Scientific Translations, Ltd., Jerusalem.
MOS TRANSISTOR ELEMENTS FOR A COMPUTING AND STORAGE MEDIUM WITH VARIABLE ADJUSTMENT STRUCTURE
E. I. Belyaev, A. I. Mishin, and V. G. Khrushchev *In its* Computer Elements and Systems, Issue Nos. 32-34, 1969 1972 p 171-189 refs (See N72-24216 15-08)
Avail: NTIS HC $17.75

N72-24260# Israel Program for Scientific Translations, Ltd., Jerusalem.
COMPUTERIZED CONTROL OF DEPOSITION OF FILMS WITH GIVEN THICKNESS
V. A. Lvov, V. A. Sterelyukhin, and E. I. Cherepov *In its* Computer Elem. and Systems, Issue nos. 35-37, 1969 •1971 p 87-89 refs (See N72-24251 15-08)
Avail: NTIS HC $17.00

N72-24576# Joint Publications Research Service, Arlington, Va.
EFFECT OF SURFACE ACTIVE SUBSTANCES ON INTERMETALLIDE CRYSTAL GROWTH
R. R. Malinovskiy and V. I. Tararyshkin *In its* Nonferrous Met. 9 May 1972 p 112-114 refs (See N72-24575 15-17)
Avail: NTIS HC $3.00

27 PROPELLANTS

Includes fuels; igniters; and oxidizers. For basic research see: 06 Chemistry; and 33 Thermodynamics and Combustion. For related information see also: 28 Propulsion Systems.

N72-24801*# Union Carbide Corp., New York.
STUDY OF OPTIMUM PROPELLANT PRODUCTION FACILITIES FOR LAUNCH OF SPACE SHUTTLE VEHICLES
L. M. LaClair Sep. 1970 159 p
(Contract NAS10-7134)
(NASA-CR-126546) Avail: NTIS HC $10.00 CSCL 21I

An integrated propellant manufacturing plant and distribution system located at Kennedy Space Center is studied. The initial planned propellant and pressurant production amounted to 160 tons/day (TPD) LH2, 10 TPD GH2, 800 TPD LO2, 400 TPD LN2, and 120 TPD GN2. This was based on a shuttle launch frequency of 104 per year. During the study, developments occurred which may lower cryogen requirements. A variety of plant and processing equipment sizes and costs are considered for redundancy and supply level considerations. Steam reforming is compared to partial oxidation as a means of generating hydrogen. Electric motors, steam turbines, and gas turbines are evaluated for driving compression equipment. Various sites on and off Government property are considered to determine tradeoffs between costs and problems directly associated with the site, product delivery and storage costs, raw material costs, and energy costs. Coproduction of other products such as deuterium, methanol, and ammonia are considered. Legal questions are discussed concerning a private company's liabilities and its rights to market commercial products under Government tax and cost shelters. Author

N72-24802# National Defense Research Organization TNO, Rijswijk (Netherlands).
THE HEAT GENERATION TEST FOR THE DETERMINATION OF THE SELF-IGNITION HAZARD AND THE BALLISTIC STABILITY OF NITRATE ESTER PROPELLANTS
J. L. C. vanGeel 6 Dec. 1971 23 p refs
(TL-1971-1; TDCK-059108) Avail: NTIS HC $3.25 CSCL 21I

A description is given of the heat generation test with which the self-ignition hazard and the ballistic stability of nitrate ester propellants is predicted for a storage period of 10 years. The heat generation of the propellant is measured at 358 K during 7 days. From the measurements the safe diameter of the propellant is calculated, a quantity which is characteristic of the self-ignition hazard. The test results also provide information about the decrease in calorific value for a storage period of 10 years in the tropics or in a moderate climate. This decrease in calorific value gives information about the ballistic stability of the propellant. Author

N72-24803# Explosives Research and Development Establishment, Waltham Abbey (England).
PLASTIC PROPELLANT RHEOLOGY: THE VELOCITY PROFILE IN TUBULAR FLOW
Virginia M. Chudyszewicz and W. A. Dukes Apr. 1971 14 p refs
(ERDE-TN-30; BR25797) Avail: NTIS HC $3.00

The form of the velocity profile of plastic propellant in tubular flow, that is the shape of the deformation across the tube at a given time, was derived from the flow equation established by parallel plate plastometry. The profile approximates a cubic curve at the wall, and is flattened exponentially towards the center. This flattening is caused by the strain dependence of the plastoviscosity. A typical experimental profile was fitted by varying a proportionality constant and a power for the degree of flattening in the equation for the predicted profile. Excellent agreement was achieved by this semiquantitative method. The deformation of an end-burning rocket change caused by acceleration during launching may be predicted using this technique. Author (ESRO)

N72-24804# Explosives Research and Development Establishment, Waltham Abbey (England).
IMPROVEMENTS IN TENSILE TESTING OF COMPOSITE PROPELLANTS
R. P. Ayerst and B. G. Tucker Jul. 1971 33 p refs
(ERDE-TR-75; BR27226) Avail: NTIS HC $3.75

A method of time temperature superpositioning of tensile test data applied to the assessment of experimental plastic propellant compositions is described. Experimental improvements were made with regard to the estimation of the effective gage length (including a comparison of the procedure with the American (ICRPG) standard method). The computerization of the calculations performed on tensile data is also considered. Author (ESRO)

N72-24805# Army Foreign Science and Technology Center, Charlottesville, Va.
INTERIOR BALLISTICS OF TUBE WEAPONS AND SOLID PROPELLANT ROCKETS (TABLE OF CONTENTS)
M. E. Serebryakov 3 Feb. 1972 9 p Transl. into ENGLISH of Russian State Standard "Vnutri Ballistika Stvolnykh Sistem i Porokhovykh Raket" Moscow, 1962
(AD-737960; FSTC-HT-23-1502-71) Avail: NTIS CSCL 19/6

Contents: The theoretical basis of internal ballistics; The peculiarities of burning solid propellant charges in a rocket chamber; The physical fundamentals of the phenomenon of firing from barrel systems; Solving problems of internal ballistics and the basic principles of the process of firing for bore systems. GRA

N72-24806# Southwest Research Inst., San Antonio, Tex.
RESEARCH ON HYDROCARBON FUELS AND RELATED APPLICATIONS Technical Report, 1 Dec. 1970 - 30 Nov. 1971
Robert K. Johnson, Charles M. Monita et al Wright-Patterson AFB, Ohio AFAPL Jan. 1972 82 p refs
(Contract F33615-69-C-1231; AF Proj. 3048; AF Proj. 3066)
(AD-737833; SWRI-RS-581; AFAPL-TR-70-5-Pt-3) Avail: NTIS CSCL 21/4

Studies of the effects of various materials on jet fuel stability were made. Studies of equipment and procedure for rating fuel stability dealt primarily with the JFTOT fuel coker and with methods of polishing heater tubes for use in other fuel cokers. Fuel lubricity was investigated by means of a simulator measuring the starting friction of a valve spool; major sources of error have been identified and recommendations made for a minimum redesign. Fuel corrosion inhibitors were evaluated. Short-term studies have been made of analytical methods for fuel system icing inhibitor and oxygen content of fuels, along with investigation of fuel dyes, fuel compatibility of plastics, fuel acid number determinations, and calibration of the water separometer (WSIM) apparatus. Operation of an existing

information retrieval system has been continued, and jet fuel property data from world-wide procurement processed and analyzed. GRA

28 PROPULSION SYSTEMS

Includes air breathing, electric, liquid, solid, and magneto-hydrodynamic propulsion. For nuclear propulsion see: 22 Nuclear Engineering. For basic research see: 23 Physics, General; and 33 Thermodynamics and Combustion. For applications see: 31 Space Vehicles. For related information see also: 27 Propellants.

N72-24807 Ohio State Univ., Columbus.
MECHANISM OF MIXING OF TWO NONREACTING GASES Ph.D. Thesis
Paul James Ortwerth 1971 158 p
Avail: Univ. Microfilms Order No. 71-22518

The turbulence phenomena associated with the mixing of fuel and air in a supersonic combustion ramjet were studied. The turbulence generated by coaxial and normal jet fuel injection was studied by analyzing a control volume in which fuel and air are mixed. These two modes of fuel injection were examined for various initial condictions in order to compare their respective characteristics and determine the design advantages of each mode. The results of this analysis show that large turbulence energies can be generated, much larger than the energy added by the jet. A universal plot for a diatomic gas gamma = 1.4 was determined for which specific impulse losses are found to be a function of relative turbulence intensity and flight speed. Experimental results from a compressible turbulent shear flow experiment, the decay of a supersonic free jet were used in formulating a new theoretical model for turbulent shear flow. A fuel injector designed to maximize the turbulent kinetic energy was tested to verify the existing mixing rate correlations. Dissert. Abstr.

N72-24808*# Wyle Labs., Inc., Huntsville, Ala.
EFFECTS OF HIGH COMBUSTION CHAMBER PRESSURE ON ROCKET NOISE ENVIRONMENT
S. P. Pao Apr. 1972 97 p refs
(Contract NAS8-27298)
(NASA-CR-126548; WR-75-6) Avail: NTIS HC $7.00 CSCL 21H

The acoustical environment for a high combustion chamber pressure engine was examined in detail, using both conventional and advanced theoretical analysis. The influence of elevated chamber pressure on the rocket noise environment was established, based on increase in exit velocity and flame temperature, and changes in basic engine dimensions. Compared to large rocket engines, the overall sound power level is found to be 1.5 dB higher, if the thrust is the same. The peak Strouhal number shifted about one octave lower to a value near 0.01. Data on apparent sound source location and directivity patterns are also presented. Author

N72-24809*# Arizona Univ., Tucson. Engineering Experiment Station.
PRECOMPUTED STATE DEPENDENT DIGITAL CONTROL OF A NUCLEAR ROCKET ENGINE Semiannual Report
Morris Ray Johnson Jun. 1972 163 p refs
(Grant NGL-03-002-006)
(NASA-CR-126649) Avail: NTIS HC $10.25 CSCL 21H

A control method applicable to multiple-input multiple-output nonlinear time-invariant systems in which desired behavior can be expressed explicitly as a trajectory in system state space is developed. The precomputed state dependent control method is basically a synthesis technique in which a suboptimal control law is developed off-line, prior to system operation. This law is obtained by conducting searches at a finite number of points in state space, in the vicinity of some desired trajectory, to obtain a set of constant control vectors which tend to return the system to the desired trajectory. These vectors are used to evaluate the unknown coefficients in a control law having an assumed hyperellipsoidal form. The resulting coefficients constitute the heart of the controller and are used in the on-line computation of control vectors. Two examples of PSDC are given prior to the more detailed description of the NERVA control system development. Author

N72-24810*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYSIS OF A SUPERSONIC-COMBUSTION ROCKET CONCEPT
Leo Franciscus Feb. 1972 28 p refs
(NASA-TM-X-68020; E-6825) Avail: NTIS CSCL 21H

A preliminary analysis has been made of a supersonic-combustion rocket engine concept using hydrogen and oxygen propellants. The ejector action of a separate small rocket motor is employed to pump the propellants to high stagnation pressures and supersonic velocities. Therefore complicated heavy turbopumps are eliminated and cooling problems of a sonic throat are reduced. The results of the study show that vacuum specific impulse levels as high as a conventional rocket having the same chamber pressure as the drive motor are possible. The supersonic-combustion rocket would be an attractive alternate for a high-altitude low-thrust conventional rocket operating with a pressure feed propellant system. It would also be a convenient technique for obtaining extremely high thrusts without the need for developing corresponding large turbopumps. Author

N72-24811*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
GRID-TRANSLATION BEAM DEFLECTION SYSTEMS FOR 5-cm AND 30-cm DIAMETER KAUFMAN THRUSTERS
Walter C. Lathem 19 Apr. 1972 11 p refs Presented at 9th Elec. Propulsion Conf., Washington, D. C., 17-19 Apr. 1972; Sponsored by AIAA
(NASA-TM-X-68029; E-6835) Avail: NTIS HC $3.00 CSCL 21C

A 5-cm grid translation mechanism has been developed capable of 10 deg beam deflection. A 2026-hour endurance test was run at a preset 10 deg deflection angle and an extrapolated lifetime of better than 10,000 hours obtained. Response time data for grid translation are presented. Preliminary results for a 30-cm diameter system are given and results of a theoretical analysis of a dished grid system are discussed. Author

N72-24812*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EXHAUST FLOW AND PROPULSION CHARACTERISTICS OF A PULSED MPD ARC THRUSTER
Charles J. Michels and Thomas M. York (Pa. State Univ., University Park) 1972 15 p refs Presented at 9th Elec. Propulsion Conf., Washington, D. C., 17-19 Apr. 1972; Sponsored by AIAA
(NASA-TM-X-68026; E-6832) Avail: NTIS HC $3.00 CSCL 21C

An experimental investigation of the near-field megawatt, single-shot exhaust is presented for the self-field and auxiliary field cases (0-2 T). Plasma impact pressure and number density are correlated to provide velocity profiles (30,000 to 70,000 m/sec), thrust (10 to 120 N), impulse (3 to 16 N-sec) and mass accouting. The data agree with Hugel's self-field theory for the case where thrust is produced entirely by electromagnetic force. The data show that the thrust monatonically increases with auxiliary field. Author

N72-24813*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PRELIMINARY PERFORMANCE OF A LOW LOADING HIGH TIP SPEED FAN STAGE

Everett E. Bailey Mar. 1972 11 p ref
(NASA-TM-X-68027; E-6826) Avail: NTIS HC $3.00 CSCL 21E

Limited data indicates the feasibility of designing fan stages for operation with weak oblique shocks in the rotor blade tip region. A 1600 ft/sec rotor tip speed fan indicated an overall efficiency of 0.846 at a pressure ratio of 1.51 even though the rotor blades had incurred damage in the leading edge tip region prior to obtaining the design speed performance. After the test it was observed that a number of the rotor blade mid-span dampers had failed, subsequently damaging a number of rotor blades in the leading edge tip region. Author

N72-24814# Joint Publications Research Service, Arlington, Va.
GAS TURBINE VANES
8 May 1972 24 p refs Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 2, 1971 p 28-35 and 86-90
(JPRS-55924) Avail: NTIS HC $3.25

Results of thermal fatigue, and failure studies are reported for gas turbine vanes subjected to static tensile loads and thermal cycling tests. For individual titles, see N72-24815 through N72-24816.

N72-24815# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF FAILURE OF GAS TURBINE VANES UNDER INFLUENCE OF THERMAL CYCLES
G. N. Tretyachenko *In its* Gas Turbine Vanes 8 May 1972 p 1-13 refs (See N72-24814 15-28)
Avail: NTIS HC $3.25

The basic principles of failure for gas turbine engines were studied by investigating short-term thermal cycles in turbine vane models. The effect was studied of mechanical loads including vibration and tensile loads that develop during rotor rotation due to centrifugal forces on thermal cracking. It is concluded that vane failure is governed by: (1) chemical reaction of surface layers with fuel combustion products; (2) accumulation of cyclic deformations at the edges due to thermal stresses occurring during heating and cooling; and (3) cyclic stresses due to vibration. F.O.S.

N72-24816# Joint Publications Research Service, Arlington, Va.
EVALUATION OF EFFECT OF STATIC LOAD ON HEAT RESISTANCE OF GAS TURBINE VANES UNDER THERMAL CYCLING CONDITIONS
G. N. Tretyachenko and A. P. Voloshchenko *In its* Gas Turbine Vanes 8 May 1972 p 14-22 refs (See N72-24814 15-28)
Avail: NTIS HC $3.25

The thermal fatigue of full-scale models of rotor vanes for gas turbines was investigated under conditions of simultaneous action of cyclic and rapidly changing temperatures simulating the cyclic change of operation modes, and static tensile loads. It was found that stresses from static loads are compressive, and are equal in absolute value to the maximum tensile thermal stresses in the cycle. It is concluded that there is a range of static tensile loads that increases the maximum stresses in the vanes which cause a decrease in the heat resistance of the vanes. F.O.S.

N72-24817*# Hughes Research Labs., Malibu, Calif.
LOW VOLTAGE 30cm ION THRUSTER Final Report, 3 Aug. 1970 - 31 Dec. 1971
Feb. 1972 184 p refs
(Contract NAS3-14140)
(NASA-CR-120919) Avail: NTIS HC $11.25 CSCL 21C

The construction of an ion thruster module (including thruster, power conditioning, and control system) capable of operating for 10,000 hours over a five to one range at an effective specific impulse of approximately 2800 seconds is discussed. The several interrelated tasks involved in the construction of the engine are described. Performance tests of the engine and the effects of various modifications are reported. It was demonstrated that thruster performance and stability were not materially affected by reasonable changes from the nominal operating point. Author

N72-24818*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THRUST MEASUREMENTS OF A HOLLOW-CATHODE DISCHARGE
Aaron Snyder and Bruce A. Banks Washington Mar. 1972 20 p refs
(NASA-TN-D-6705; E-6691) Avail: NTIS HC $3.00 CSCL 21C

Thrust measurements of a hollow cathode mercury discharge were made with a synthetic mica target on a torsion pendulum. Thrust measurements were made for various target angles, tip temperatures, flow rates, keeper discharge powers, and accelerator electrode voltages. The experimental thrust data are compared with theoretical values for the case where no discharge power was employed. Author

N72-24819*# AiResearch Mfg. Co., Los Angeles, Calif.
HYPERSONIC RESEARCH ENGINE PROJECT. PHASE 2: STRUCTURES AND COOLING DEVELOPMENT Interim Technical Data Report No. 16, 3 Nov. 1970 - 2 Feb. 1971
L. F. Jilly 18 Mar. 1971 85 p refs
(Contract NAS1-6666)
(NASA-CR-112057; AP-71-7185) Avail: NTIS HC $6.25 CSCL 21H

Testing of the structures assembly model (SAM) continued at the Langley 8-foot high-temperature structures tunnel. A total of 30 test runs were completed, involving 38 loading cycles for the SAM. Fuel injection was used during 27 of the cycles. That portion of the program specifically aimed at thermal-cycling evaluation was completed. For these runs, tunnel total conditions ranged to 2200 psia and 3000 R. The tunnel nozzle is fixed and produces Mach numbers near 7 at the test conditions. The coolant for all runs was ambient-temperature hydrogen. The condition of the SAM following these runs was satisfactory. Isolated leaks occurred at joints in the cooled structure, but they have not affected operation or resulted in local areas of overheating. Three punctures in the leading edge, caused by foreign object damage, were present during most of the run; however, they showed no signs of propagation or distress due to overheating. Author

N72-24820*# General Electric Co., Evendale, Ohio. Aircraft Engine Group.
ACOUSTIC TESTING OF A 1.5 PRESSURE RATIO LOW TIP SPEED FAN WITH CASING TIP BLEED (QEP FAN B SCALE MODEL)
S. B. Kazin, W. R. Minzner, and J. E. Paas [1971] 91 p ref
(Contract NAS3-12430)
(NASA-CR-120822) Avail: NTIS HC $6.75 CSCL 21H

A scale model of the bypass flow region of a 1.5 pressure ratio, single stage, low tip speed fan was tested with a rotor tip casing bleed slot to determine its effects on noise generation. The bleed slot was located 1/2 inch (1.3 cm) upstream of the rotor leading edge and was configured to be a continuous opening around the circumference. The bleed manifold system was operated over a range of bleed rates corresponding to as much as 6% of the fan flow at approach thrust and 4.25% of the fan flow at takeoff thrust. Acoustic results indicate that a bleed rate of 4% of the fan flow reduces the fan maximum approach 200 foot (61.0 m) sideline PNL 0.5 PNdB and the corresponding takeoff thrust noise 1.1 PNdB below the level with zero bleed. However, comparison of the standard casing (no bleed slot) and the slotted bleed casing with zero bleed shows that the bleed slot itself caused a noise increase. Author

N72-24821*# Teledyne Brown Engineering, Huntsville, Ala.
SPACE TUG PROPULSION SYSTEM FAILURE MODE, EFFECTS AND CRITICALITY ANALYSIS
J. W. Boyd, E. P. Hardison, C. B. Heard, J. C. ORourke, F. Osborne, and L. T. Wakefield 11 May 1972 181 p ref
(Contract NAS8-21804)
(NASA-CR-61388) Avail: NTIS HC $11.25 CSCL 21H

For purposes of the study, the propulsion system was considered as consisting of the following: (1) main engine

system, (2) auxiliary propulsion system, (3) pneumatic system, (4) hydrogen feed, fill, drain and vent system, (5) oxygen feed, fill, drain and vent system, and (6) helium reentry purge system. Each component was critically examined to identify possible failure modes and the subsequent effect on mission success. Each space tug mission consists of three phases: launch to separation from shuttle, separation to redocking, and redocking to landing. The analysis considered the results of failure of a component during each phase of the mission. After the failure modes of each component were tabulated, those components whose failure would result in possible or certain loss of mission or inability to return the Tug to ground were identified as critical components and a criticality number determined for each. The criticality number of a component denotes the number of mission failures in one million missions due to the loss of that component. A total of 68 components were identified as critical with criticality numbers ranging from 1 to 2990. Author

N72-24822# General Motors Corp., Indianapolis, Ind. Detroit Diesel Allison Div.

A CERAMIC THERMAL BARRIER FOR HIGH TEMPERATURE ENGINE COMPONENTS

R. L. Newman, K. R. Cross, W. C. Spicer, H. D. Sheets (Battelle Mem. Inst., St. Louis, Mo.), and T. D. Driskell (Battelle Mem. Inst., St. Louis, Mo.) Sep. 1971 66 p refs Backup document for AIAA Synoptic, "Application of Thermal Barriers to High Temperature Engine Components", scheduled for publication in Journal of Aircraft in Sep. 1972

(Rept-21-C-71F) Avail: NTIS HC $5.50

Cooling systems for controlling the structural temperatures of turbine engines are discussed. The thermal barrier, a low conductivity coating, is a means of reducing the cooling requirements. The chief benefit of the thermal barrier will be in saving the cooling air. The relative merits of a thin, monolithic structure and a thick reinforced structure are examined. A test program to match or exceed engine conditions with selected ceramic systems is included. The materials tested were alumina (high shock resistance), zirconia (low thermal conductivity), and zircon foam (very low conductivity). Author

N72-24823*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

PULSE PERFORMANCE ANALYSIS FOR SMALL HYPERGOLIC-PROPELLANT ROCKET ENGINES

Gerald W. Smith and Richard H. Sforzini (Auburn Univ.) 13 Apr. 1972 37 p refs Backup document for AIAA Synoptic scheduled for publication in Journal of Spacecraft and Rockets in Aug. 1972

(NASA-TM-X-64673) Avail: NTIS HC $4.00 CSCL 21H

Small rocket engine tests were conducted for the purpose of obtaining pulse performance data to aid in preliminary design and evaluation of attitude control systems. Both monopropellant and hypergolic bipropellant engines of thrust levels from 1 to 100 lbs were tested. The performance data for the hypergolic propellant rockets are compared with theoretical performance calculated from idealized chamber filling and evacuation characteristics. Electromechanical delays in valve response and heat transfer characteristics were found to cause substantial deviation between theoretical and test performance. The theoretical analysis is modified to obtain a semi-empirical model for hypergolic propellant rockets which is demonstrated to be reasonably accurate for two different engine configurations over a considerable range of duty cycles. Author

N72-24824# Joint Publications Research Service, Arlington, Va.

STATISTICAL EVALUATION OF CHARACTERISTICS OF HEAT-RESISTANT MATERIALS FOR GAS TURBINE ENGINES

I. P. Bulygin, N. I. Parfenova, L. N. Timofeyeva, and I. I. Trunin 16 May 1972 10 p refs Transl. into ENGLISH from Probl. Prochnosti (Moscow), no. 10, 1970 p 20-24

(JPRS-56002) Avail: NTIS HC $3.00

The changes in long-term tensile strength and creep as a function of test temperature and test time were investigated in EP109VD nickel alloy and EI961 steel for gas turbine engine applications. The results were analyzed statistically, and it was determined that the dispersion of the characteristics can serve as a criterion for time and temperature limits of reliable working capacity. N.E.N.

N72-24825# Joint Publications Research Service, Arlington, Va.

INCREASE IN RELIABILITY OF GAS TURBINE ENGINES

15 May 1972 23 p refs Transl. into ENGLISH from Problemy Prochnosti, No. 7, 1971

(JPRS-55987) Avail: NTIS HC $3.25

Investigations on the mechanical properties of vanes and disks of gas turbine engines are reported. For individual titles, see N72-24826 through N72-24827.

N72-24826# Joint Publications Research Service, Arlington, Va.

FATIGUE STRENGTH OF MODELS OF GAS TURBINE VANES DURING PROGRAMMED TEMPERATURE CHANGE APPROXIMATING THE OPTIONAL CHANGE

B. N. Sinayskiy *In its* Increase in Reliability of Gas Turbine Engines 15 May 1972 p 62-68 refs (See N72-24825 15-28)

Avail: NTIS HC $3.25

The fatigue strength and durability of vane models were investigated under isothermal conditions and with programmed temperature changes, simulating the thermal conditions of working turbine vanes. For reproducing static tensile stresses produced by centrifugal forces during fatigue tests, the vane model was made in the form of a double closed model of a working turbine vane, fabricated from cast refractory nickel-based ZhS6K alloy. Smooth cylindrical specimens of the same alloy, 9 mm in diameter, were tested to obtain comparative characteristics of fatigue strength and durability. Author

N72-24827# Joint Publications Research Service, Arlington, Va.

INVESTIGATION OF THE CONDITION OF TURBINE DISC MATERIAL AFTER OPERATION

I. A. Kozlov, V. N. Rudenko, and G. V. Rybenok *In its* Increase in Reliability of Gas Turbine Engines 15 May 1972 p 78-82 refs (See N72-24825 15-28)

Avail: NTIS HC $3.25

The mechanical properties of short smooth specimens of turbine disks were determined. Turbine disks with 0, 143, 2221, and 2934 hours of operation were cut on anode-mechanical machines. The specimens were kept in the elastic region during the tests. Impact toughness, creep, and short-term and long-term tensile strength tests were performed. It is felt that the results indicate high performance characteristics of the alloys with low damage under conditions of long-term loads and high temperatures. N.E.N.

N72-24828*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.

LF467 CONCEPT DEFINITION

Jan. 1972 121 p refs

(Contract NAS3-15690)

(NASA-CR-120909; R72-AEG-207) Avail: NTIS HC $8.25 CSCL 21A

The LF467 concept is discussed. The LF467 is an advanced turbotip lift fan intended for application with the YJ97-GE-100 turbojet gas generator on a V/STOL transport research aircraft. The program objective was to define a fan that develops a reasonably high (1.30) fan pressure ratio consistent with propulsion requirements of a V/STOL research transport aircraft and that exhibits the ability to achieve a 100 PNdE overall noise objective through the use of modest additional installation treatment. The aerodynamic and mechanical designs of this system and the resulting configuration, weight, and noise predictions are presented. Author

N72-24829*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DRIVE TURBINE SYSTEMS FOR 20-INCH TURBOFAN SIMULATORS. 1: DUCT TURBINE DESIGN
Warren J. Whitney May 1972 18 p refs
(NASA-TM-X-68081; E-6972) Avail: NTIS HC $3.00 CSCL 21E

A study was made to evolve the turbine drive systems for 20-inch turbofan engine simulators. The fan designs used in the simulators included single-stage and two-stage configurations that covered a wide range of rotative speed and power requirement. The objective assumed for the study was to evolve one core turbine design that could drive all of the single-stage fans and, when operated in combination with one duct turbine design, drive all of the two-stage fans. The duct turbine power output is then needed to determine the make-up power required of the core turbine over the range of two-stage fan operating conditions. The duct turbine design analysis is reported and includes the selection of the duct turbine velocity diagram, a description of the blade design, and a determination of its off-design performance. Adjustable stators were found to be quite advantageous to the duct turbine off-design operation. The use of adjustable stators enabled the duct turbine to accomodate fan mass flow at all operating points and caused the duct turbine power output to increase as the total power requirement increased. This in turn resulted in a core turbine make-up power requirement that was not significantly greater than that required for driving the single-stage fans. Author

N72-24830*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
REVIEW OF JET ENGINE EMISSIONS
Jack Grobman 1972 17 p refs Presented at the DOT Surv. Conf., Climatic Impact Assessment Program, Cambridge, Mass., 15-16 Feb. 1972
(NASA-TM-X-68064; E-6938) Avail: NTIS HC $3.00 CSCL 21E

A review of the emission characteristics of jet engines is presented. The sources and concentrations of the various constituents in the engine exhaust and the influence of engine operating conditions on emissions are discussed. Cruise emissions to be expected from supersonic engines are compared with emissions from subsonic engines. The basic operating principles of the gas turbine combustor are reviewed together with the effects of combustor operating conditions on emissions. The performance criteria that determine the design of gas turbine combustors are discussed. Combustor design techniques are considered that may be used to reduce emissions. Author

N72-24831# Instituto Nacional de Tecnica Aeroespacial, Madrid (Spain).
A COMPARATIVE STUDY OF CHEMICAL AND NONCHEMICAL PROPULSION SYTEMS FOR ATTITUDE CONTROL AND ORBIT CORRECTION OF GEOSTATIONARY SATELLITES IN THE 500 TO 1000 kg CLASS. PART B: APPLICATION OF THE PROPULSION SYSTEMS TO A PARTICULAR SATELLITE CONFIGURATION
E. Fraga and A. Crespo Paris ESRO Jul. 1971 56 p refs
(Contract ESTEC-912/70)
(ESRO-CR-38) Avail: NTIS HC $5.00

A comparative study was made of chemical (hydrazine as monopropellant, bipropellant of the type N204/UDMM), electrical (resistojet, ion thrustor, colloid thrustor), and mixed chemical-electrical propulsion systems suitable for the attitude control of geostationary satellites. The suitability of these various systems for a proposed space mission is compared on the basis of criteria suvh as the dry mass of propulsion systems, propellant mass, electrical energy requirement, number of thrustors, critical problems, including storage. It is concluded that the most suitable propulsion system seems to be a combination of a chemical system for the first part of the mission, and ionic propulsion for the second. Author (ESRO)

N72-24832# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AIR MICROTURBINES
A. S. Natalevich 6 Dec. 1971 96 p refs Transl. into ENGLISH of the publ. "Vozdushnyve Mikroturbiny" Moscow, Izd-vo Mashinostr., 1970 p 1-208
(AD-737881; FTD-MT-24-124-71) Avail: NTIS CSCL 21/5

The book deals with questions on the theory of designing and testing axial and centripetal low-power turbines (microturbines) with full and partial gas feed. Such turbines are used for accessory drive of airplanes and as engines in other power equipment, and also in high-speed pneumatic tools and in turbocompressed gas-refrigerators. The book was written for engineering-technical and scientific workers of aviation, refrigeration and machine-tool industries. Author (GRA)

29 SPACE RADIATION

Includes cosmic radiation; solar flares; solar radiation, and Van Allen radiation belts. For related information see also: 13 Geophysics; and 24 Physics, Atomic, Molecular, and Nuclear.

N72-24833*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
STUDY OF ENERGETIC SOLAR PARTICLE EVENTS OF 18 NOVEMBER 1968, 25 FEBRUARY 1969, AND 30 MARCH 1969
P. Venkatarangan (Calgary Univ., Alberta, Canada), D. Venkatesan, and J. A. VanAllen 1971 61 p refs
(Grant NGL-16-001-002)
(NASA-CR-126661; U-of-Iowa-71-27) Avail: NTIS HC $5.25 CSCL 03B

The solar particle events of 18 November 1968, 25 February 1969, and 30 March 1969 were studied using data from the detector system aboard the lunar orbiting satellite Explorer 35. Protons, alpha particles, and Z > or = 3 nuclei were registered in the solid state detector of the system. Interplanetary propagation, particle anisotropy, and the intensity ratios of protons to alpha particles and of alpha particles to C, N, and O nuclei above a common specific energy of 0.5 MeV/nucleon were studied. Diffusion coefficients and decay constants for the three events are given, as well as magnitudes and directions of anisotropies. Author

N72-24834*# Stanford Univ., Calif. Inst. for Plasma Research.
DIVERS SOLAR ROTATION
John M. Wilcox and Karl Schindler, ed. (European Space Res. Inst.) 1971 9 p refs Repr. from Cosmic Plasma Phys., 1972 p 157-164 Presented at Conf. on Cosmic Plasma Phys., Frascati, Italy, 20-24 Sep. 1971
(Grant NGL-05-003-230; Contract N00014-69-A-0200-1049; Grant NSF GA-16765)
(NASA-CR-126645) Avail: NTIS HC $3.00 CSCL 03B

The rotational properties in the photospheric and solar wind plasma and magnetic fields are considered. In both the photosphere and the interplanetary medium near the earth, there is a tendency for the field patterns to rotate a few percent faster than the plasma patterns. The fields and plasmas show variability in their rotational properties on time scales of days or months, but averages over a few years tend to be less variable, as shown by the results for long-lived sunspots, and by the rotating solar magnetic dipole. Author

N72-24835*# California Inst. of Tech., Pasadena.
SOLAR FLARE PARTICLE PROPAGATION: COMPARISON OF A NEW ANALYTIC SOLUTION WITH SPACECRAFT MEASUREMENTS Ph.D. Thesis
John Edward Lupton May 1972 188 p refs
(Contract NAS5-9312; Grants NGR-05-002-160;

NGL-05-002-007)
(NASA-CR-122406) Avail: NTIS HC $11.50 CSCL 03B

An analytic solution was obtained to the complete Fokker-Planck equation for solar flare particle propagation including the effects of convection, energy-change, corotation, and diffusion. It is assumed that the particles are injected impulsively at a single point in space, and that a boundary exists beyond which the particles are free to escape. Several solar flare particle events were observed with solar and galactic cosmic ray experiment aboard OGO 6. Detailed comparisons of the predictions of the solution with observations of 1 to 70 MeV protons show that the model adequately describes both the rise and decay times. The solution also yields a time evolution for the vector anisotropy which agrees well with reported observations. Author

N72-24836*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EFFECTS OF SIMULATED SPACE RADIATION ON SELECTED OPTICAL MATERIALS
C. A. Nicoletta and A. G. Eubanks Washington May 1972 17 p refs
(NASA-TN-D-6758; G-1056) Avail: NTIS HC $3.00

The effect of simulated Nimbus spacecraft orbital (1100 km, circular, and polar) radiation on wide bandpass glass filters, narrow bandpass thin film interference filters, and several fused silicas was determined by transmittance measurements over the 200 to 3400 nanom wavelength region. No changes were observed in the filters, which were shielded with fused silica during irradiation, after exposure to a 1-year equivalent orbital dose of electrons, nor in the fused silicas after the same electron exposure plus a 1-year equivalent dose of protons. Exposure to a 1/2-year equivalent dose of solar ultraviolet radiation caused a significant degradation in the transmittance of two ultraviolet-transmitting interference filters but had no effect on two colored glass filters that transmitted in the visible and near infrared regions. As a result of the ultraviolet exposure the fused silicas exhibited losses of several percent over the 200- to 300 nanom wavelength region. Author

N72-24837# Los Alamos Scientific Lab., N.Mex.
VELA 5 AND 6 SOLAR X-RAY ATLAS. 6: JANUARY 1 TO MAY 1, 1971
N. K. Blocker, W. H. Chambers, P. E. Fehlau, J. C. Fuller, W. E. Kunz, and R. W. Milkey Dec. 1971 123 p refs
(Contract W-7405-eng-36)
(LA-4454-Vol-6) Avail: NTIS

Data were obtained from the solar radiation monitors on the Vela 6 satellites. Equivalent gray body flux in three bands (0.3 to 3, 1 to 8, and 1 to 16 A) is plotted as a function of universal time. Data from January 1 to May 1, 1971, are presented.
Author (NSA)

N72-24838# Deutsches Elektronen-Synchrotron, Hamburg (West Germany).
HIGH-ENERGY PARTICLES IN COSMIC RADIATION SOURCES
M. Grewing (Bonn Univ.) [1972] 23 p In GERMAN
(NP-19148) Avail: AEC Depository Libraries

The incidence of high-energy particles in supernovae, radiogalaxies, quasars, and pulsars is discussed. NSA

N72-24839# Atomic Energy of Canada Ltd., Chalk River (Ontario).
COSMIC RAY IGY NEUTRON MONITOR DATA. 1: MONTHLY GRAPHS, JANUARY - DECEMBER 1958
J. F. Steljes Dec. 1971 50 p refs
(AECL-4079) Avail: AEC Depository Libraries; Atomic Energy of Can., Ltd., Chalk River: $1.00

Uncorrected and barometer-corrected hourly rates from Deep River are given in tabular form for the period from January 1958 to December 1958. The barometer-corrected data were normalized to remove the effects of changes of efficiency and are compatible with the results of the 48-NM-64 monitor. Graphs of the corrected data are given. Author (NSA)

N72-24840# Atomic Energy Commission, New York. Health and Safety Lab.
COSMIC RADIATION IN THE ATMOSPHERE, 1969-1970
Jan. 1972 26 p refs
(HASL-248) Avail: NTIS

Calculations of charged particle intensities in the atmosphere were carried out and compared with balloon flight measurements of ionization and charged particle flux. Except near the top of the atmosphere, discrepancies were less than 20%. Calculations of the sea level total charged particle flux, the hard component of the charged particle flux, and the vertical muon flux at 1 GeV/c were in close agreement with values reported. Fluxes and spectra associated with these calculations are presented and their accuracies assessed. Author (NSA)

N72-24841# Consiglio Nazional delle Ricerche, Bologna (Italy).
HARD X-RAY SPECTRUM OF NP 0532
C. Cavani, F. Frontera, F. Fuligni, and D. Brini 1971 12 p refs Submitted for publication
(NS-15/9-1971) Avail: NTIS HC $3.00

The results of the analysis of data obtained during a balloon flight launched from Gap (France) in June 1970 are reported. The aim of the experiment was to observe the energy spectrum of the pulsed X-ray emission from NP 0532 in the range from 20 to 200 keV. Four energy intervals were selected: 20 to 40, 40 to 60, 60 to 100, and 100 to 200 keV. A mechanism for generation and acceleration of particles is proposed.
Author (ESRO)

N72-24842# Uppsala Univ. (Sweden). Cosmic Ray Group.
THE 27-DAY VARIATION OF SOLAR ACTIVITY, COSMIC RAY INTENSITY AND GEOMAGNETIC ACTIVITY Final Scientific Report
Eric Dyring 1 Sep. 1971 14 p refs
(Contract F61052-68-C-0034; AF Proj. 8600)
(AD-737789; UU/CRG-71-5; AFCRL-71-0541) Avail: NTIS CSCL 03/2

Zurich relative sunspot numbers, 10.7 cm solar radio flux, cosmic ray neutron monitor intensities and geomagnetic A(p)-data during 1958-69 and geomagnetic K(p)-data during 1932-69 have been analysed by use of time series methods to study variations with periods 5-40 days and correlations between the parameters. All the parameters show a 27-day variation. For the cosmic ray intensity and the geomagnetic activity this variation is dependent on the solar cycle. By use of filtering techniques the cosmic ray intensity and the geomagnetic activity are studied on individual solar rotations for 1958-69. From power spectrum analysis on geomagnetic K(p)-data 1932-69 higher harmonics of the 27-day period are generally found. For many years there exists a 13.5-day variation with a magnitude excluding it to be an effect of the mathematical treatment. The effect may tentatively be related to the active longitudes on the sun.
Author (GRA)

N72-24889# Max-Planck-Institut fuer Physik und Astrophysik, Munich (West Germany).
THEORETICAL ASPECTS OF THE SOLAR WIND
R. Luest *In* ESRO Planetary Space Missions Sep. 1970 p 1-13 refs (See N72-24888 15-30)
Avail: NTIS HC $7.00

N72-24890# Max-Planck-Institut fuer Physik und Astrophysik, Munich (West Germany).
COMETARY PLASMA TAILS AND THEIR INTERACTION WITH THE INTERPLANETARY GAS
Rh. Luest *In* ESRO Planetary Space Missions Sep. 1970 15-24 refs (See N72-24888 15-30)
Avail: NTIS HC $7.00

30 SPACE SCIENCES

Includes astronomy and astrophysics; cosmology; lunar and planetary flight and exploration; and theoretical analysis of orbit and trajectory. For related information see also: 11 Facilities, Research and Support; and 31 Space Vehicles.

N72-24843 Rochester Univ., N.Y.
THE CRAB NEBULA AND ITS PULSAR Ph.D. Thesis
Paul Geoffrey Murdin 1970 180 p
Avail: Univ. Microfilms Order No. 71-22311

The Crab nebula is described, and evidence is given that it contains an active, energetic supernova remnant identified with the pulsar NP 0532. The behavior of the pulsar during 1969-1970 was observed. There are no quasi-sinusoidal oscillations at the level previously reported and there is a small increase in the rate of change of the period of the pulsar by 2 parts in 100,000. These changes may have been caused by the spin-up event of 28 September 1969. The star-quake theory of the spin-up in the Vela pulsar and modifications to account for the Crab nebula pulsar behavior are discussed. The modifications are dependent on the rate of loss of rotational energy. The one most consistent with the braking index of 2.22 views the pulsar as a rotating neutron star, losing angular momentum by a mixture of mass loss and magnetic dipole mechanisms, the magnetic field of the star being threaded through the crust. The spin-up in September 1969 is supposed due to a relaxation of the crust, which compressed the magnetic field and caused greater radiation loss. Gravitational radiation may play a part in the loss of the rotational energy. Dissert. Abstr.

N72-24844 Case Western Reserve Univ., Cleveland, Ohio.
SPACE DISTRIBUTION OF STARS IN THE SOUTHERN MILKY WAY: A REGION IN VELA Ph.D. Thesis
William Hugh Wooden, II 1971 190 p
Avail: Univ. Microfilms Order No. 71-228-68

V magnitudes, B-V colors, and spectral types were determined for 6195 stars in the region LF 13, an area of 17.1 square degrees. The magnitude limit of the data is approximately V = 12.5. It appears that the region is a local window in the galaxy. Space densities of the stars in LF 13 were computed as a function of spectral type and distance from the sun. The B0-B3 stars more distant than 4 kiloparsecs tend to lie at longitudes greater than 281 deg. Concentrations of early A, A2-A6, and gG7-k4 stars are found at 600 parsecs from the sun. The space density of the A7-F5 stars is twice the average value found for other galactic regions at 600 parsecs. General luminosity functions evaluated at 100, 200, 400, and 600 parsecs do not differ substantially from the standard van Rhijn function.
Dissert. Abstr.

N72-24845 Florida Univ., Gainesville.
OPTICAL VARIATIONS OF QUASARS AND RELATED GALAXIES Ph.D. Thesis
George H. Folsom, III 1970 238 p
Avail: Univ. Microfilms Order No. 71-24422

Of the known variables, the N-galaxy 3C 371 was most active, the quasar 3C 454.3 was least active, and the Seyfert galaxy 3C 120 showed an intermediate level of activity during 1969 and 1970. Overall variability statistics for quasars are described. In December of 1969 a photographic survey was made of selected PKS radio sources south of declination + 1 deg at the El Roble Astronomical Station in Chile. The El Roble and Florida results for quasars show good correlation between large-amplitude optical changes and small spectral index in the GHz range. Two kinds of violent activity were observed among the Florida program quasars: rapid flare activity superimposed on a slowly varying background, and isolated flare activity which appears to occur at regular intervals. Ohio radio sources having peaked or flat spectra were studied for optical identifications by using the variability criterion. Dissert. Abstr.

N72-24846 Florida Univ., Gainesville.
JUPITER'S DECAMETRIC FLUX: A CONSISTENT TWO DIMENSIONAL ANALYSIS, 1957 - 1960 Ph.D. Thesis
Hugh Richard Miller 1970 255 p
Avail: Univ. Microfilms Order No. 71-24439

A two-dimensional analysis of the flux density as a simultaneous function of the longitude of the central meridian and the position of Io from superior geocentric conjunction was made. A definite symmetry about the Earth-Jupiter line was observed which appears to be associated with four Io-related sources. The two-dimensional analysis of the flux density was also used to determine if there exist simultaneous favorable positions of Io and Europa and Io and Ganymede for which the intensity of the radiation is enhanced. A study was made of the flux density versus sunspot number, Jovicentric declination of the Earth, and brightness of the coronal 5303 A line to determine which parameter appears to have more influence on the observed 11-year cycle of the Jovian radiation probability. In a pulse-height analysis of the Jupiter flux data, the average flux density of the three peak pulses received in a five-minute interval was plotted versus the number of five-minute intervals.
Dissert. Abstr.

N72-24847*# Pennsylvania State Univ., University Park. Dept. of Aerospace Engineering.
INVESTIGATION OF TECHNICAL PROBLEMS RELATED TO RETRIEVAL OF UNCOOPERATIVE ORBITING OBJECTS Semiannual Progress Report
Marshall H. Kaplan Jan. 1972 64 p refs
(Grant NGR-39-009-162)
(NASA-CR-126657; SAPR-4) Avail: NTIS HC $5.25 CSCL 22A

Preliminary work on high altitude deployment of payloads was carried out. The problem of optimal transfer of the retrieval package from space shuttle to target was studied. The problem was characterized as a nonlinear boundary value problem with a terminal constraint on approach direction. Methods of identifying spin axis and direction are considered. K.P.D.

N72-24848*# Harvard Univ., Cambridge, Mass. Dept. of Geological Sciences.
EXPERIMENTAL PETROLOGY AND ORIGIN OF FRA MAURO ROCKS AND SOIL
David Walker, John Longhi, and James Fred Hays [1972] 61 p refs
(Grants NGR-22-007-175; NGR-22-007-199)
(NASA-CR-126656) Avail: NTIS HC $5.25 CSCL 03B

Melting experiments over the pressure range 0 to 20 kilobars were conducted on Apollo 14 igneous rocks 14310 and 14072 and on comprehensive fines 14259. The mineralogy and textures of rocks 14310 and 14072 are presumed to be the result of near-surface crystallization. The chemical compositions of the samples show special relationships to multiply-saturated liquids in the system: anorthite-forsterite-fayalite-silica at low pressure. Partial melting of a lunar crust consisting largely of plagioclase, low calcium pyroxene, and olivine, followed by crystal fractionation at the lunar surface is proposed as a mechanism for the production of the igneous rocks and soil glasses sampled by Apollo 14. Author

N72-24849*# Stanford Univ., Calif. Inst. for Plasma Research.
ACTIVITY IN GALAXIES AND QUASARS
P. A. Sturrock Nov. 1971 36 p refs
(Grants NGL-05-020-272; NSF GP-23840)
(NASA-CR-126650; SU-IPR-443) Avail: NTIS HC $4.00 CSCL 03A

Activity in galaxies and quasars is interpreted in terms of plasma processes occurring in the magnetosphere of a magnetoid model. The magnetoid is comprised of a core and an annulus rotating about a common axis with different angular velocities. It is conjectured that the transition from a closed force field configuration to an open one will be effected by an MHD eruptive instability, and that such eruptions lead to high velocity

clouds of cool gas, identified with clouds producing absorption lines in quasars. The ejection of radio clouds from galaxies and quasars is attributed to galactic flares. Current sheets contain mildly relativistic electrons moving in directions partially transverse to the magnetic field. Synchrotron radiation from these electrons is held responsible for the nonthermal radiation from quasars and certain galaxies. It is proposed that minor instabilities of the current sheets are responsible for fluctuations in the nonthermal luminosity and for small scale radio bursts sometimes observed. Author

N72-24850*# California Inst. of Tech., Pasadena.
GRAVITATIONAL-WAVE ASTRONOMY
William H. Press and Kip S. Thorne Feb. 1972 94 p refs
(Contract NAS7-100; Grants NGR-05-002-256; NSF GP-28027; NSF GP-27304)
(NASA-CR-126667; OAP-273) Avail: NTIS HC $6.75 CSCL 03A

The significance of experimental evidence for gravitational waves is considered for astronomy. Properties, generation, and astrophysical sources of the waves are discussed. Gravitational wave receivers and antennas are described. A review of the Weber experiment is presented. K.P.D.

N72-24851*# Analytical Mechanics Associates, Inc., Seabrook, Md.
NONLINEAR AND ADAPTIVE ESTIMATION TECHNIQUES IN REENTRY Final Report
Andrew H. Jazwinski (Business and Technol. Systems, Inc., Bowie, Md.), Samuel Pines, Conrad Hipkins, and Paul Flanagan Feb. 1972 72 p refs
(Contract NAS8-26973)
(NASA-CR-123540; Rept-72-6) Avail: NTIS HC $5.75 CSCL 22A

The development and testing of nonlinear and adaptive estimators for reentry (e.g. space shuttle) navigation and model parameter estimation or identification are reported. Of particular interest is the identifcation of vehicle lift and drag characteristics in real time. Several nonlinear filters were developed and simulated. Adaptive filters for the real time identification of vehicle lift and drag characteristics, and unmodelable acceleration, were also developed and tested by simulation. The simulations feature an uncertain system environment with rather arbitrary model errors, thus providing a definitive test of estimator performance. It was found that nonlinear effects are indeed significant in reentry trajectory estimation and a nonlinear filter is demonstrated which successfully tracks through nonlinearities without degrading the information content of the data. Under the same conditions the usual extended Kalman filter diverges and is useless. The J-adaptive filter is shown to successfully track errors in the modeled vehicle lift and drag characteristics. The same filter concept is also shown to track successfully through rather arbitrary model errors, including lift and drag errors, vehicle mass errors, atmospheric density errors, and wind gust errors. Author

N72-24852*# Scientific Translation Service, Santa Barbara, Calif.
THE PLANETS: SOLVED AND UNSOLVED PROBLEMS
D. Ya. Martynov Washington NASA May 1972 94 p Transl. into ENGLISH of the book "Planety: Reshennyye: Nereshennyye Probl." Moscow, Nauka Press, 1970
(Contract NASw-2035)
(NASA-TT-F-698) Avail: NTIS HC $3.00 CSCL 03B

A survey of the resolved and unresolved problems of planetary physics is presented. The contribution of worldwide research in the fields of astronomy, surface astronomy, space technology and other fields to planetary physics is reviewed. A list of physical constants for all planets and their satellites is given. Author

N72-24853*# Teledyne Brown Engineering, Huntsville, Ala.
SKYLAB EXPERIMENT PERFORMANCE EVALUATION MANUAL
J. E. Meyers Jan. 1972 29 p refs
(Contract NAS8-21804)
(NASA-CR-61386) Avail: NTIS HC $3.50 CSCL 22A

A series of preparation analyses used for evaluating the performance of the Skylab corollary experiments under preflight, in-flight, and postflight conditions is given. Experiment continegency plan work-around procedure and malfunction analyses are presented in order to assist in making the experiment operationally succesful. Author

N72-24854*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE INDUCED MAGNETIC FIELD OF THE MOON: CONDUCTIVITY PROFILES AND INFRARED TEMPERATURE
C. P. Sonett, B. F. Smith, D. S. Colburn, G. Schubert (Calif. Univ., Los Angeles), and K. Schwartz (Am. Nucleonics Corp., Woodland Hills, Calif.) May 1972 80 p refs
(NASA-TM-X-62153) Avail: NTIS HC $6.00 CSCL 03B

Electromagnetic induction in the moon driven by fluctuations of the interplanetary magnetic field is used to determine the lunar bulk electrical conductivity. The present data clearly show the north-south and east-west transfer function difference as well as high frequency rollover. The difference is shown to be compatible over the mid-frequency range with a noise source associated with the compression of the local remanent field by solar wind dynamic pressure fluctuations. Models for two, three, and four layer; current layer, double current layer, and vore plus current layer moons are generated by inversion of the data using a theory which incorporates higher order multipoles. Core radii conductivities generally are in the range 1200 to 1300 km and 0.001 to 0.003 mhos/m; and for the conducting shell 1500 to 1700 km with 0.0001 to 0.0007 mhos/m with an outer layer taken as nonconducting. Core temperature based on available olivine data is 700 to 1000 C. Author

N72-24855*# Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
APOLLO LUNAR SURFACE EXPERIMENTS PACKAGE Monthly Progress Review
Mar. 1972 98 p refs
(Contract NAS9-5829)
(NASA-CR-115577; BSR-3299) Avail: NTIS HC $7.00 CSCL 03B

Developments in the ALSEP program are reported. A summary of the status for the total ALSEP program is included. Other areas discussed include: (1) status of Apollo 16 (array D) and Apollo 17 (array E), (2) lunar seismic profiling experiment, (3) lunar ejecta and meteorites experiment, and (4) lunar mass spectrometer experiments. F.O.S.

N72-24856*# Scientific Translation Service, Santa Barbara, Calif.
ORIGIN OF THE ASTEROIDS
V. A. Bronshten Washington NASA May 1972 19 p refs Transl. into ENGLISH from Zemlya Vselennaya (USSR), Sep. - Oct. 1971 p 53-59
(Contract NASw-2035)
(NASA-TT-F-14266) Avail: NTIS HC $3.00 CSCL 03A

The origin of the asteroids is discussed in the light of the current state of knowledge. The topics include asteroid orbits and masses, asteroid distribution according to periods, the history of asteroid fragmentation, and the disintegration of the hypothetical planet Phaeton. Some details are given on a Phaeton model according to which iron-nickel meteorities are fragments of the nuvleus, iron-stone meteorites are fragments of the middle layer, and stone meteorites are fragments of the mantle of the exploded planet. Author

N72-24857*# Pittsburgh Univ., Pa. Dept. of Earth and Planetary Sciences.
VENUS CLOUDS: A DIRTY HYDROCHLORIC ACID MODEL

Bruce Hapke [1971] 17 p refs
(Grant NGL-39-011-085; JPL-953032)
(NASA-CR-126654) Avail: NTIS HC $3.00 CSCL 03B

The spectral and polarization data for Venus are consistent with micron-sized, aerosol cloud particles of hydrochloric acid containing soluble and insoluble iron compounds, whose source could be volcanic or crustal dust. The ultraviolet features could arise from variations in the Fe-HCl concentration in the cloud particles. Author

N72-24858*# Geological Survey, Washington, D.C.
APOLLO 16 (DESCARTES) LANDING SITE ROAD LOG
E. L. Boudette, J. P. Schafer, and D. P. Elston Apr. 1972 20 p refs
(NASA Order T-5874-A)
(NASA-CR-126646; USGS-IR-NASA-46) Avail: NTIS HC $3.00 CSCL 22C

The landing site traverse log is presented for the Apollo 16 mission. EVA's 1, 2, and 3 are included. K.P.D.

N72-24859*# Translation Consultants, Ltd., Arlington, Va.
EXOGENETIC PROCESSES ON THE SURFACE OF LUNAR MARIA
A. T. Bazilevskiy and V. P. Polosukhin Washington NASA Apr. 1972 7 p Transl. into ENGLISH from Priroda (USSR), no. 11, Nov. 1971 p 13-15
(Contract NASw-2038)
(NASA-TT-F-14182) Avail: NTIS HC $3.00 CSCL 03B

The manner in which the structure of the surfaces of lunar maria has evolved is discussed, and a four-layer model is presented. Author

N72-24860*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
PERFORMANCE OF THE CSM RCS DURING THE AS 506/CSM 107/LM 5 MISSION (APOLLO 11)
W. Nelson Lingle, Lonnie W. Jenkins, and Chester A. Vaughan 31 Dec. 1969 60 p
(NASA-TM-X-68346; MSC-00171-Sup-3) Avail: NTIS HC $5.00 CSCL 22C

The Apollo 11 service module and the command module (CM) reaction control system performed satisfactorily throughout the mission. Two anomalies which occurred were an inadvertent isolation valve closure during command and service module/Saturn S4B/lunar module separation and a failure of a CM thruster to respond to automatic commands. The isolation valves were later opened by the crew and remained open during the remainder of the mission. The cause of the closure was determined to be the shock loads generated during separation. The CM engine malfunction was caused by a faulty terminal board connector. All system parameters were normal during the mission, and all mission requirements were satisfied. Author

N72-24861*# Geological Survey, Washington, D.C.
GEOLOGY OF HADLEY RILLE Preliminary Report
K. A. Howard, J. W. Head (Bellcomm Inc.), and G. A. Swann Jan. 1972 63 p refs
(Contract NASw-417; NASA Order T-65253-G; NASA Order W-13130)
(NASA-CR-126644; USGS-IR-NASA-41) Avail: NTIS HC $5.25 CSCL 03B

The regional setting, external and internal shape, and materials of Hadley Rille near the Apollo 15 landing site are described. The petrography presented includes lithologies, regolith, talus, and outcrops. The stratigraphy exposed on the rille wall is also considered. K.P.D.

N72-24862*# National Aeronautics and Space Administration, Washington, D.C.
MARINER MARS 1971: PRESS KIT
Richard T. Mittauer 30 Apr. 1971 63 p
(NASA-News-Release-71-75) Avail: NASA Scientific and Technical Information Facility, P. O. Box 33, College Park, Md. 20740 CSCL 22A

The news release describes the 1971 launches of Mariner 8 and 9 which were to be the first attempt by NASA to orbit another planet, Mars. Described are: (1) mission capsule; (2) planetary missions; (3) aiming zones; (4) the spacecraft; (5) scientific experiments to be performed; (6) Atlas Centaur launch vehicle; (7) launch operations; (8) tracking and data system and mission operations; and (9) Mariner Mars 71 team and subcontractors. A.L.

N72-24863*# California Univ., Berkeley. Space Sciences Lab.
RADIATION MEASUREMENT EXPERIMENT FOR APPLICATIONS TECHNOLOGY SATELLITE-E Final Report
Forrest Mozer 9 Mar. 1972 35 p refs
(Contract NAS5-10362)
(NASA-CR-122415; SSL-Ser-13-Issue-23) Avail: NTIS HC $3.75 CSCL 22B

Scintillation detectors are described for the ATS 5 satellite. Operation, electronics, and experiment sequencing and telemetry are considered. Schematics and calibration tables are included. K.P.D.

N72-24864*# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
COMPLEX PERMITTIVITY MEASUREMENTS OF LUNAR SAMPLES AT MICROWAVE AND MILLIMETER WAVELENGTHS
Harold L. Bassett and Robert G. Shackelford Mar. 1972 9 p refs
(Contract NAS9-11574)
(NASA-CR-115571) Avail: NTIS HC $3.00 CSCL 03B

The relative dielectric constant and loss tangent of lunar sample 14163,164 (fine dust) were determined as a function of density at 9.375, 24, 35, and 60 GHz. In addition, such measurements have also been performed on lunar sample 14310,74 (solid rock) at 9.375 GHz. The loss tangent was found to be frequency independent at these test frequencies and had a value of 0.015 for the lunar dust sample. Author

N72-24865# Joint Publications Research Service, Arlington, Va.
SOVIET-BLOC RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE, NO. 274
14 Apr. 1972 85 p refs Transl. into ENGLISH from Russian Publications
(JPRS-55715) Avail: NTIS HC $6.25

Translations and abstracts of articles are presented on meteorology, oceanography, upper atmosphere and space research, astronomy and terrestrial geogphysics, covering both science news and formal scientific reports. Published details of Soviet space spectaculars are included. Author

N72-24866# Joint Publications Research Service, Arlington, Va.
SOVIET-BLOC RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE, NO. 273
31 Mar. 1972 63 p Transl. into ENGLISH from Russian reports
(JPRS-55595) Avail: NTIS HC $5.25

Materials from recent publications of the Soviet bloc countries are presented in the form of abstracts, summaries, and occasionally full articles. The topics covered are astronomy, meteorology, oceanography, geology, upper atmosphere, and space research. Author

N72-24867*# DBA Systems, Inc., Lanham, Md.
METRIC ANALYSIS OF MINITRACK OPTICAL AND INTERFEROMETER DATA Final Report, 1 Jul. 1969 - 30 Jun. 1971
Duane C. Brown, George E. Morduch, and James B. Willman 30 Jun. 1971 314 p refs

(Contract NAS5-10783)
(NASA-CR-122396) Avail: NTIS HC $17.75 CSCL 22A

The network analysis program (NAP-2), which has the capability of simultaneously solving for orbits and tracking station error model terms, was, after several modifications, used in the calibration of minitrack stations using minitrack satellite measurements (self-calibration). Several support programs were written to aid in this task. A simultaneous four-arc solution was obtained. A comparison with optically determined arcs for the same time spans showed rms position differences of 67m, 86m, 124m and 168m for the 4 arcs considered. An apparatus incorporating a diffraction grating was designed and successfully used to measure the drift rate of the Fort Myers MOTS camera drive. Author

N72-24868*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
HIGH ENERGY ASTRONOMY OBSERVATORY MISSION C, PHASE A. VOLUME 1: EXECUTIVE SUMMARY
Jan. 1972 117 p
(NASA-TM-X-64652) Avail: NTIS HC $8.00 CSCL 03A

The primary objective of HEAO: C is a detailed study of high energy sources, using grazing incidence X-ray telescopes and a spacecraft pointing accuracy of + or - 1 arc minute. A principal design goal for the HEAO-C spacecraft was to maximize commonality with the spacecraft designed for Missions A and B; technical transfusion between the designs required the Phase A study to be accomplished in parallel with Phase B definition of the precursor spacecraft. Plans call for a HEAO-C launch between 1 and 1-1/2 years after the launch of HEAO-B. The HEAO-C will be launched on the Titan 3 D and placed into a 270-nautical-mile circular orbit with a 28.5 degree inclination; the Phase A baseline concept weighs under 16000 pounds, carries three grazing incidence X-ray telescopes with multiple focal plane experiments plus several supporting experiments and is designed for a two-year operational life. The HEAO-C is a candidate for early satellite retrieval with the space shuttle. Author

N72-24869*# Cornell Univ., Ithaca, N.Y. Center for Radiophysics and Space Research.
RESEARCH ON LUNAR MATERIALS Final Report, 3 Jun. 1968 - 31 Jan. 1971
Apr. 1971 41 p refs
(Contract NAS9-8018)
(NASA-CR-115585; CRSR-435) Avail: NTIS HC $4.25 CSCL 03B

Studies on the optical and electrical properties of Apollo 11 and 12 soil and rock chip samples are presented. Author

N72-24870*# Cornell Univ., Ithaca, N.Y.
SOME PHYSICAL PROPERTIES OF APOLLO 12 LUNAR SAMPLES
T. Gold, B. T. OLeary, and M. Campbell *In its* Res. on Lunar Mater. Apr. 1971 p 2-24 refs (See N72-24869 15-30)
Avail: NTIS HC $4.25 CSCL 03B

The size distribution of the lunar fines is measured, and small but significant differences are found between the Apollo 11 and 12 samples as well as among the Apollo 12 core samples. The observed differences in grain size distribtuion in the core samples are related to surface transportation processes, and the importance of a sedimentation process versus meteoritic impact gardening of the mare grounds is discussed. The optical and the radio frequency electrical properties are measured and are also found to differ only slightly from Apollo 11 results. Author

N72-24871*# Cornell Univ., Ithaca, N.Y.
OPTICAL AND HIGH FREQUENCY ELECTRICAL PROPERTIES OF THE LUNAR SAMPLE
T. Gold, B. T. OLeary, and M. Campbell *In its* Res. on Lunar Mater. Apr. 1971 p 25-39 refs (See N72-24869 15-30)
Avail: NTIS HC $4.25 CSCL 03B

Reflectivity and polarization laws for the powder sample and its spectrum are close to the mean for the lunar maria. Solid samples show a marked absorption feature at 1 micron. The low albedo appears to be due to a surface coating on dust grains rather than volume absorption. The high frequency electrical properties resemble those of a fine powder made from typical dense terrestrial rocks, and are consistent with previous ground-based radar estimates. The differential mass spectrum is almost constant from 100 micron particles down to 0.1 micron; most particles are smaller than 0.3 micron. Their shapes disclose a variety of generation processes. Author

N72-24872*# Bureau of Mines, Morgantown, W.Va.
INFRARED AND RAMAN SPECTROSCOPIC STUDIES OF STRUCTURAL VARIATIONS IN MINERALS FROM APOLLO 11, 12, 14 AND 15 SAMPLES, VOLUME 3 Final Report
Patricia A. Estep, J. J. Kovach, P. Waldstein, and C. Karr, Jr. [1972] 42 p refs
(NASA Order T-1760-A)
(NASA-CR-115581) Avail: NTIS HC $4.25 CSCL 03B

Infrared and Raman vibrational spectroscopic data, yielding direct information on molecular structure, were obtained for single grains (> 150 microns) of minerals, basalts, and glasses isolated from Apollo 11, 12, 14, and 15 rock and dust samples, and for grains in Apollo 14 polished butt samples. From the vibrational data, specification substitutions were determined for the predominant silicate minerals of plagioclase, pyroxene, and olivine. Unique spectral variations for grains of K-feldspar, orthopyroxene, pyroxenoid, and ilmenite were observed to exceed the ranges of terrestrial samples, and these variations may be correlatable with formation histories. Alpha-quartz was isolated as pure single grains, in granitic grains composited with sanidine, and in unique grains that were intimately mixed with varying amounts of glass. Accessory minerals of chromite and ulvospinel were isolated as pure grains and structurally characterized from their distinctive infrared spectra. Fundamental vibrations of the SiO4 tetrahedra in silicate minerals were used to classify bulk compositions in dust sieved fractions, basalt grains and glass particles, and to compare modal characteristics for maria, highland and rille samples. No hydrated minerals were found in any of the samples studied, indicating anhydrous formation conditions. Author

N72-24873*# Techtran Corp., Glen Burnie, Md.
THE MINOR PLANETS
F. Yu. Zigel Washington NASA May 1972 106 p refs Transl. into ENGLISH from "Malyye Planety" Moscow, Nauka Press, 1969
(Contract NASw-2037)
(NASA-TT-F-700) Avail: NTIS HC $3.00 CSCL 03B

Studies of the asteroids and their relationship to meteroids and comets are discussed, and details are given on the more interesting asteroids. Direct astronomical observation and laboratory data on meteorites, singly and in combination, are used to study the asteroids. The real and apparent motion and orbits are described, along with asteroid family identification and the three-body problem. The characteristics are given of the Trojan group, Eros, Ganymede and its group, Hidalgo, Icarus, and the Amor, Apollo, Adonis, and Hermes group. The small bodies in the solar system are identified as asteroids, comets, and products of their destruction (meteorites, meteoric bodies, and cosmic dust), and their physical characteristics and composition are outlined. The composition of tektites and locations of discovery are discussed, and it is felt that they are most likely to be glassy meteorites. The hypothetical planet Phaeton is also considered and it is pointed out that the problem of the origin of the asteroid belt is still unsolved. N.E.N.

N72-24874*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ULTRAVIOLET PHOTOMETRY OF THE ECLIPSING VARIABLE CW CEPHEI

Stanley Sobieski Washington May 1972 12 p refs (NASA-TN-D-6757; G-1063) Avail: NTIS HC $3.00 CSCL 03A

A series of photometric observations was made of the eclipsing variable CW Cephei on the OAO 2. Approximate elements were derived from the eclipse depths and shape of the secondary. Persistent asymmetries and anomalous light variations, larger than the expevted experimental error, were also found, subsequent ground-based observations show H alpha entirely in emission, indicating the presence of an extended gaseous system surrounding one or both components. A detailed comparison was made of the flux distribution of the binary relative to that for the nominally unreddened stars delta Pic, BIIII, and eta Aur, B3V, to investigate the effects of interstellar extinction. The resultant extinction curves, normalized at a wavelength of 3330 A, show a relatively smooth increase with decreasing wavelength. Author

N72-24875*# Scientific Translation Service, Santa Barbara, Calif.
MINERAL COMPOSITION OF THE FUSION CRUST AND ALSO THE METEORITIC AND METEORIC DUST OF THE SIKHOTE-ALIN METEORITE
V. D. Kolomenskiy Washington NASA May 1972 12 p refs Transl. into ENGLISH from Meteoritika (Moscow), v. 16, 1958 p 59-66
(Contract NASw-2035)
(NASA-TT-F-14268) Avail: NTIS HC $3.00 CSCL 03B

A mineralogical investigation found that the main mineral of the outer zone of the Sikhote-Alin meteorite fusion crust is oxymagnetite. The fusion crust has of an outer zone and an inner zone. The outer zone consists mainly of oxymagnetite, iocite, and rare grains of nickel-iron, and the inner zone consists of iocite and nickzl-iron. The meteoritic dust consists of nickel-iron and of magnetite. The meteoric dust is encountered in the form of dense and cavity-filled spheres and of filaments; the composition corresponds to oxymagnetite. Author

N72-24876# Joint Publications Research Service, Arlington, Va.
SOVIET BLOC RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE, NO. 275
9 May 1972 94 p Transl. into ENGLISH from Russian reports (JPRS-55941) Avail: NTIS HC $6.75

Summaries and abstracts of Soviet-block newspaper and journal articles are presented on astronomy, meteorology, oceanography, geophysics, upper atmosphere, and space programs. For individual titles, see N72-24877 through N72-24881.

N72-24877# Joint Publications Research Service, Arlington, Va.
ASTRONOMY
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 275 9 May 1972 p 1-14 (See N72-24876 15-30)
Avail: NTIS HC $6.75

Selected articles on astronomical research and instruments are abstracted. Pulsars, quasar-type radio sources, various lunar explorations, interplanetary dust capture, three-body problem, shadow effects on artificial satellite orbits, and observations of planetary atmospheres, surfaces, orbital elements, and optical properties are mentioned. N.E.N

N72-24878# Joint Publications Research Service, Arlington, Va.
METEOROLOGY c20
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 275 9 May 1972 p 15-21 (See N72-24876 15-30)
Avail: NTIS HC $6.75

News and scientific articles on meteorological investigations are summarized. Cloud photograph interpretation, high cyclones in Central Asia and Kazakhstan, turbulent diffusion in the lower troposphere, radioactive tracers for atmospheric mixing measurements, twilight phenomena, and isotopic composition of Antarctica air are covered. N.E.N.

N72-24879# Joint Publications Research Service, Arlington, Va.
OCEANOGRAPHY c13
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 275 9 May 1972 p 22-40 (See N72-24876 15-30)
Avail: NTIS HC $6.75

Abstracts on marine investigations and scientific cruises are presented. The emphasis is on marine biology, surface and deep layer properties, and sedimentation. Marine chemistry, wind fields over oceans, and oceanographic data processing and analysis are also studied. N.E.N.

N72-24880# Joint Publications Research Service, Arlington, Va.
TERRESTRIAL GEOPHYSICS c13
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 275 9 May 1972 p 41-56 (See N72-24876 15-30)
Avail: NTIS HC $6.75

Studies of geophysics are briefly reported, with the emphasis on earthquake investigations, crustal structure and thickness determinations, and geomagnetism. Geothermal activity surveys, magnetotelluric sounding data, oil and gas resources, gravimetry, and data processing techniques are also mentioned. N.E.N.

N72-24881# Joint Publications Research Service, Arlington, Va.
UPPER ATMOSPHERE AND SPACE RESEARCH c13
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 275 9 May 1972 p 57-83 (See N72-24876 15-30)
Avail: NTIS HC $6.57

Summaries and abstracts are presented of articles on ionospheric and meteor studies and reports of satellite launchings. Cosmic rays, aerial and spaceborne photography and earth resources surveys, short wave communication in the Antarctic, and U.S.S.R.-French cooperation in space programs are also covered. N.E.N.

N72-24882# Academy of Sciences (USSR), Moscow.
COSMIC DATA: MONTHLY REVIEW NO. 6, JUNE 1971
1972 77 p In RUSSIAN; ENGLISH summary
Avail: NTIS HC $6.00

Results of June 1971 observations are presented for geophysical phenomena concerning electric and magnetic states of the upper atmosphere (geomagnetic variations, ionosphere, cosmic rays and earth currents). Solar activity data are also given. Author

N72-24883# Academy of Sciences (USSR), Moscow.
COSMIC DATA: MONTHLY REVIEW NO. 7, JULY 1971
1972 59 p In RUSSIAN; ENGLISH summary
Avail: NTIS HC $5.00

The results are presented for July 1971 and observations of geophysical phenomena concerning electric and magnetic states of the upper atmosphere (geomagnetic variations, ionosphere, cosmic rays and earth currents); solar activity data are also given. Author

N72-24884# Academy of Athens (Greece).
[RESEARCH AND TEACHING PROGRAMS OF ASTRONOMICAL INSTITUTES OF GREECE] Annual Reports
Greek Natl. Comm. for Astronomy 1971 16 p refs
Avail: NTIS HC $3.00

The teaching and research programs of the individual institutes are briefly outlined, and the publications, meetings, and staffs are listed. N.E.N.

N72-24885*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
APOLLO 14: SOME GEOCHEMICAL ASPECTS
John A. Philpotts, C. C. Schnetzler, David F. Nava, Michael L. Bottino, Paul D. Fullagar, Herman H. Thomas, Shuford Schuhmann, and Charles W. Kouns Apr. 1972 31 p refs Submitted for publication

(NASA-TM-X-65877; X-644-72-99) Avail: NTIS HC $3.75 CSCL 03B

Chemical analyses were obtained for five samples of Apollo 14 regolith fines, three 14230 core samples, soil clod 14049, breccias 14305 and 14319, 14310 basalt, and some separated phases. The chemical uniformity of these Apollo 14 samples indicates thorough mixing and/or uniform source rocks. Basalt 14310 can be matched well in composition by a four to one mixture of soil and plagioclase. The Eu(2+)/Eu(3+) ratios calculated for 14310 pigeonite and plagioclase are similar to those for Apollo 12 and 15 mare-type basalt phases; this indicates similar redox conditions. Apollo 14 samples are chemically similar to Apollo 12 and 15 KREEP as distinct from Apollo 11, 12, and 15 and Luna 16 mare-type basalts. Author

N72-24886# Sproul Observatory, Swarthmore, Pa.
DYNAMICAL PARALLAXES
W. D. Heintz [1972] 2 p ref
Avail: NTIS HC $3.00

Calculation of dynamical parallax is considered, using both an orbit and assumed mass-luminosity relationship. Adaptation to systems containing an unresolved subsystem is also discussed. K.P.D.

N72-24887*# Hughes Aircraft Co., Los Angeles, Calif. Space and Communications Group.
HIGH-POWER S-BAND EXPERIMENT STUDY: OBJECTIVES, DESCRIPTION, PLANNING AND OPERATION OF EXPERIMENT FOR ATS-G SPACECRAFT Final Report, 20 Oct. 1971 - 18 Feb. 1972
Robert M. Walp Mar. 1972 64 p
(Contract NAS5-21671)
(NASA-CR-122420; SCG-20124R) Avail: NTIS HC $5.25 CSCL 22C

The results of a study to develop and define requirements for the high power S-band experiment for the ATS-G are summarized. The objectives of the experiment are: (1) to demonstrate high power technology at S-band frequencies in orbiting spacecraft, (2) to employ high power carrier from the spacecraft for conducting interference measurements with Instructional Television Fixed Service systems, and (3) to provide means for performing educationally oriented applications experiments. Experiment organization and operation, and hardware for flight on the ATS-G spacecraft are described. Earth stations designed for the experiment as well as other special ground equipment are also described. Author

N72-24888# European Space Research Organization, Paris (France).
•PLANETARY SPACE MISSIONS. VOLUME 2: PHYSICS OF METEORITES AND THE INTERPLANETARY MEDIUM
Sep. 1970 100 p refs Partly in ENGLISH and partly in FRENCH Proc. of the 7th ESRO Summer School, Interlaken, Switz., 1969
(ESRO-SP-54) Avail: NTIS HC $7.00

Theoretical aspects of the solar wind and stellar winds are discussed. Cometary plasma tails and their interaction with the interplanetary gas are described and a brief account of the investigation of comets by space probes and simulation by barium clouds is given. A short survey is presented of observations and measurements of zodiacal light. For individual titles, see N72-24889 through N72-24895.

N72-24889# Max-Planck-Institut fuer Physik und Astrophysik, Munich (West Germany).
THEORETICAL ASPECTS OF THE SOLAR WIND c29
R. Luest *In* ESRO Planetary Space Missions Sep. 1970 p 1-13 refs (See N72-24888 15-30)
Avail: NTIS HC $7.00

Some of the data on the solar wind obtained from space probes are summarized, and theoretical models of the solar wind are considered. Equations are given for the transport of angular momentum, first radially from the sun and then taking azimuthal motion into account, which results in the transport of angular momentum by gas. Calculation from this model of the azimuthal velocity of the solar wind near the earth's orbit gives a lower value than that observed; theories to account for this discrepancy are considered. An investigation of transport of angular momentum from a star to the surrounding interstellar gas is mentioned, and theories of stellar winds are briefly discussed. The movement of the solar wind into interstellar space is examined. Studies of the collisionless shock transition are mentioned, and the effect of the state of ionization of the surrounding interstellar gas is discussed. Author (ESRO)

N72-24890# Max-Planck-Institut fuer Physik und Astrophysik, Munich (West Germany).
COMETARY PLASMA TAILS AND THEIR INTERACTION WITH THE INTERPLANETARY GAS c29
Rh. Luest *In* ESRO Planetary space missions Sep. 1970 15-24 refs (See N72-24888 15-30)
Avail: NTIS HC $7.00

The principal properties of comets are reviewed, followed by evidence of interaction with the solar wind and types of interaction. Some occurrences of activity in comets are then described. Current work on the structure and properties of comets is reviewed. Plans to send space probes through a cometary tail or in the close vicinity of a nucleus are under consideration; feasibility studies for such a mission were carried out, but there are inherent difficulties and not many comets are suitable. However a list of possible targets for the next ten years was prepared and contains some 5 to 10 comets. Author (ESRO)

N72-24891# Bochum Univ. (West Germany).
ZODIACAL LIGHT
R. H. Giese *In* ESRO Planetary Space Missions Sep. 1970 25-44 refs (See N72-24888 15-30)
Avail: NTIS HC $7.00

The phenomenon of zodiacal light is discussed and a short survey is given of observations of its intensity, polarization, and color ratio. In an attempt to reproduce the phenomenon, models of the interplanetary dust composition were constructed which give values approximating the measurements of intensity and polarization in the ecliptic plane. The Raleigh particle, large metallic particle, and weakly absorbing particle models are considered. They were used to calculate values out of the ecliptic plane. Author (ESRO)

N72-24892# Freiburg Univ. (West Germany).
MICROMETEORITES AND INTERPLANETARY DUST
K. Sitte *In* ESRO Planetary Space Missions Sep. 1970 p 47-64 refs (See N72-24888 15-30)
Avail: NTIS HC $7.00

Indirect evidence obtained from observations on meteors and meteor showers, and on zodiacal light is considered. Work on the dynamics of interplanetary microparticles is reviewed. Methods of obtaining direct evidence on the properties of interplanetary microparticles by means of recording instruments carried in rockets or spacecraft, and using collection experiments in which samples are brought back for analysis in the laboratory are given. Various recording techniques are described, the most important being microphones and plasma detectors. The difficulties of obtaining a large enough sample and the dangers of contamination are discussed. Recent results obtained with the recording and collection techniques are described. Author (ESRO)

N72-24893# Bern Univ. (Switzerland).
METEORITES [LES METEORITES]
J. Geiss *In* ESRO Planetary Space Missions Sep. 1970 p 65-76 refs In FRENCH (See N72-24888 15-30)
Avail: NTIS HC $7.00

Information on the solar system is obtained from the

presence of iodine 129 and traces of transuranium elements. Iodine 129 is considered to originate directly from one of the nucleosynthesis processes which has generated elements and isotopes present in the solar system. The presence of transuranium elements, which could originate from explosions of super novae (R. process), gives an indication of phenomena which happened during the billions of years preceding the formation of the solar system. Author (ESRO)

N72-24894# National Museum of Natural History, Paris (France).

METEORITES [LES METEORITES]

P. Pellas *In* ESRO Planetary Space Missions Sep. 1970 p 77-87 refs In FRENCH (See N72-24888 15-30)
Avail: NTIS HC $7.00

The different criteria used for classification of stone and iron meteorites are presented. Chemical variations within the different categories of chondrites suggest that the solar nebulae could have been chemically fractured before the time of formation of the parent bodies. Subsequent thermal development of parent bodies might be at the origin of achondrites. Age solidification determination of meteorites using the rubidium-strontium-uranium method or the thorium-plutonium method both indicate an age of 4.4 to 4.7 billion years. Author (ESRO)

N72-24895# National Museum of Natural History, Paris (France).

METEORITE DETECTORS OF HEAVY CORPUSCULAR RADIATION [LES DETECTEURS METEORITIQUES DU RAYONNEMENT CORPUSCULAIRE TRES LOURD]

P. Pellas *In* ESRO Planetary Space Missions Sep. 1970 p 89-93 refs In FRENCH (See N72-24888 15-30)
Avail: NTIS HC $7.00

In order to determine heavy high energy nuclei in galactic cosmic radiation (GCR), electron microscopic measurements of density tracks were made at different depths in a stone meteorite. The differential energy spectrum was calculated for the heavy GCR integrated in time at distances of 2 to 4 astronomical units. Results obtained from the Saint-Severin chrondrite show that the solar modulation effects are weaker than anticipated based on the Parker model in the energy range from 0.2 to 0.8 GeV per nucleon for ions of the iron group. The time constant of the energy spectrum was verified in the range from 0.8 to 1.5 GeV per nucleon. The presence of numerous traces of iron group ions (more than one billion per sq. cm.) in meteorite crystals and chondrites with contained gases of the solar isotopic composition provided information on the energy and charge spectra of early solar cosmic radiation.
Author (ESRO)

N72-24896# European Space Research Organization, Paris (France).

SPACECRAFT OPERATIONS. VOLUME 5: ORBIT DYNAMICS

Feb. 1972 148 p refs Partly in ENGLISH and partly in FRENCH Proc. of the 8th ESRO Summer School, Neu-Isenburg, West Ger., 1970
(ESRO-SP-68) Avail: NTIS HC $9.50

Problems in satellite and interplanetary spacecraft orbit calculation and perturbation are dealt with. For volume 2, see N72-24174. For individual titles, see N72-24897 through N72-24907.

N72-24897# Royal Aircraft Establishment, Farnborough (England).

ORBIT DETERMINATION AT THE ROYAL AIRCRAFT ESTABLISHMENT

R. H. Gooding *In* ESRO Spacecraft Operations, Vol. 5 Feb. 1972 p 1-15 refs (See N72-24896 15-30)
Avail: NTIS HC $9.50

A survey is given of four orbit determination programs, the general principles of orbit determination are described, and orbital parameters and perturbations are reviewed in the case of two programs. The first two programs, written in assembly language for the Pegasus computer, are no longer in use. The other two, written in standard FORTRAN may be used on any computer with a suitable compiler and large enough storage. These programs include features such as complete first-order long period perturbations in the orbital model and facility to accept range, range rate, and direction cosine observations, in addition to angles. Author (ESRO)

N72-24898# Royal Aircraft Establishment, Farnborough (England).

APPLICATIONS AND RESULTS OF ORBIT DETERMINATION

R. H. Gooding *In* ESRO Spacecraft Operations, Vol. 5 Feb. 1972 p 17-34 refs (See N72-24896 15-30)
Avail: NTIS HC $9.50

Two nonoperational objectives of satellite orbit determination and perturbation are discussed, knowledge of the earth's gravitational field and of atmospheric density and rotation. If axial symmetry of the earth is assumed, the disturbing potential can be expanded as a series of zonal harmonic terms. The even harmonics cause a satellite orbital plane to precess, the odd harmonics produce long term oscillation in eccentricity. Without axial symmetry, a two parameter family of tesseral harmonics occurs, and the perturbing force depends on sidereal time, leading to possibilities of resonance. Atmospheric effects of satellite drag decrease the semimajor axis and the eccentricity of a satellite. Some discoveries from observation of this decrease, such as atmospheric rotation, are discussed. Author (ESRO)

N72-24899# European Space Operations Center, Darmstadt (West Germany).

AN EXAMPLE OF PERTURBATION CALCULATION IN SATELLITE MECHANICS TREATED BY THE APPLICATION OF FORMAC

F. Hechler *In* ESRO Spacecraft Operations, Vol. 5 Feb. 1972 p 35-42 refs (See N72-24896 15-30)
Avail: NTIS HC $9.50

The periodic parts of satellite orbit perturbation equations, in the form of a truncated Fourier series, are derived, and the application of a special formula-manipulating compiler language (FORMAC) for their solution is discussed for extended disturbing functions. An example is given, for which a first-order theory is derived for a nearly circular orbit, which is perturbed by zonal and tesseral terms of the geopotential. An analysis is given of short periodic and secular perturbation and of long periodic parts of perturbations. Another example of a realistic perturbation calculation performed at the European Space Operations Center is given. Author (ESRO)

N72-24900# Societe Generale de Services et de Gestion, Paris (France).

KALMAN METHOD FOR THE DETERMINATION OF ORBITAL ELEMENTS BY FILTERING OF RADAR DATA [METHODE DE KALMAN, DETERMINATION DES ELEMENTS D'UNE ORBITE PAR FILTRAGE D'INFORMATIONS RADAR]

Robert Luginbuhl *In* ESRO Spacecraft Operations, Vol. 5 Feb. 1972 p 43-61 refs In FRENCH (See N72-24896 15-30)
Avail: NTIS HC $9.50

The theory of Kalman filtering is applied to optimal estimation of satellite orbital elements from radar data. A Kepler orbit is assumed, as well as the fact that zero correlation exists between measurement errors in time. A computer program for orbit calculation was developed based on these principles.
Author (ESRO)

N72-24901# European Space Operations Center, Darmstadt (West Germany).

MEANS OF SATELLITE LOCATION AND TRACKING ERRORS [MOYENS DE LOCALISATION DE SATELLITES

ZT ERREURS DE POURSUITE]
G. Parent *In* ESRO Spacecraft Operations, Vol. 5 Feb. 1972 p 63-76 refs In FRENCH (See N72-24896 15-30)
Avail: NTIS HC $9.50

Photographic and radio interferometric methods for satellite tracking, and their accuracy, are discussed. The photographic tracking method has several error sources such as orientation errors, nonperpendicularity of the axes, center positioning error of photography, slope errors, and refraction errors. The interferometric method is described in terms of measurement ambiguity. How interferometric data are corrected before orbit calculation can take place is discussed. Author (ESRO)

N72-24902# European Space Operations Center, Darmstadt (West Germany).
LAUNCH WINDOWS
E. A. Roth *In* ESRO Spacecraft Operations, Vol. 5 Feb. 1972 p 77-92 refs (See N72-24896 15-30)
Avail: NTIS HC $9.50

Near-earth and highly eccentric orbit launch windows were calculated, and applied to ESRO 4 and HEOS A2 satellites. A definition of launch window is given and methods for launch window calculation are indicated. For a near-earth satellite orbit, the constraints imposed by the oblateness of the earth and the air drag on satellite lifetime are formulated based on Lagrange's equations. The launch window was determined for the near-earth ESRO 4 satellite. For a highly eccentric orbit, the long term evolution of the orbit, and the stability were formulated, taking into account the luni-solar effect, and the launch window was calculated for the HEOS A2 satellite. Author (ESRO)

N72-24903# European Space Operations Center, Darmstadt (West Germany).
SYSTEM ASPECTS OF AN INTERPLANETARY TRAJECTORY COMPUTATION PROGRAM PACKAGE, BASED ON SPECIAL PERTURBATIONS
Herbert A. Kellner *In* ESRO Spacecraft Operations, Vol. 5 Feb. 1972 p 93-100 refs (See N72-24896 15-30)
Avail: NTIS HC $9.50

The requirements for the layout of a versatile and flexible interplanetary trajectory integration program, which has to run in different modes, are discussed. It is stipulated that the basic set-up has to consist of functionally distinct blocks. In particular, the input-processing routines, as well as those preparing the output, have to be separated by convenient interfaces from the program nucleus, which, in turn, comprises various exchangeable parts, corresponding to different types of orbit generators.
Author (ESRO)

N72-24904# Eidgenossische Technische Hochschule, Zurich (Switzerland).
THE FLYBY TECHNIQUE AND ITS NUMERICAL AND ANALYTICAL TREATMENT
Bruno Stanek *In* ESRO Spacecraft Operations, Vol 5 Feb. 1972 p 101-110 (See N72-24896 15-30)
Avail: NTIS HC $9.50

The analysis and optimization of interplanetary trajectories for flyby missions is discussed. Optimal transfer (requiring the minimum launch velocity) from one planet to another for a given launch date was computed as an application of the swingby technique. The theory of flyby is explained, using simple vector geometric means and hyperbolic two-body analysis to show the changes in heliocentric velocity and speed during the encounter with the target planet. It was observed that the totality of postencounter heliocentric orbits for a given arrival is a two-dimensional manifold. The problem of a distinct trajectory within this manifold of postencounter orbits, which leads to a third planet without further propulsion, was solved by filtering it out of the one-parametric (flight time) totality of trajectories from the swingby planet to the moving third planet. The advantages of using analytical methods are outlined for two problems dealing with the question of reaching escape velocity with respect to the solar system after a flyby. Author (ESRO)

N72-24905# International Business Machines Corp., Cambridge, Mass. Advanced Systems Dept.
EXCEPTIONAL CASES IN THE THEORY AND COMPUTATION OF ORBITS
P. Sconzo *In* ESRO Spacecraft Operations, Vol. 5 Feb. 1972 p 111-120 refs (See N72-24896 15-30)
Avail: NTIS HC $9.50

An outline of Brouwer's orbit perturbation theory is presented, and modifications leading to a set of nonsingular orbital elements are introduced. The capabilities of the FORMAC compiler language for automatic analytical developments of Brouwer's theory are summarized. Two modifications concerning the problem of eliminating the singularities at $e = 0$ and $i = 0$ from the expressions for the perturbations are illustrated. A set of nonsingular orbital elements is discussed which is used in the numerical evaluation of a differential correction. The results of an application of this set to an almost circular orbit, that of the geodetic satellite Anna, are presented. Author (ESRO)

N72-24906# Eidgenossische Technische Hochschule, Zurich (Switzerland).
THEORETICAL AND PRACTICAL ASPECTS OF ORBIT COMPUTATION
E. Stiefel *In* ESRO Spacecraft Operations Vol. 5 Feb. 1972 p 121-128 ref (See N72-24896 15-30)
Avail: NTIS HC $9.50

A theory is developed for eccentric orbit perturbation, based on Kepler motion, and applied to satellite perturbation by earth oblateness and lunar attraction effects. Recommendations are given for the numerical integration, and special and general element perturbation of the orbit. Author (ESRO)

N72-24907# European Space Operations Center, Darmstadt (West Germany).
THE IMPORTANCE OF PARTIAL DERIVATIVES IN SPACE DYNAMICS
H. G. Walter *In* ESRO Spacecraft Operations, Vol. 5 Feb. 1972 p 129-142 refs (See N72-24896 15-30)
Avail: NTIS HC $9.50

The variational method is described for calculating partial derivatives for differential correction of approximate orbit parameters. Details are given of a numerical procedure for the integration of the equations of spacecraft motion, as well as for the integration of the variational equations. The scope and structure of the computer program for the variational method are treated, and manageability of the program are underlined.
Author (ESRO)

N72-24908# Sandia Labs., Albuquerque, N.Mex.
HAVE SINEW-1 PREFLIGHT REPORT
A. C. Bustamante, D. E. Randall, J. E. Deveney, C. M. Warthev, and D. W. Berst Jan. 1972 101 p refs Sponsored by AEC (SC-RR-710354) Avail: NTIS

A preflight description of the HAVE SINEW-1 reentry test flight is presented. The test program is directed toward providing reliable instrumentation and methods of recovering impacted payloads. NSA

N72-24909# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
STOPWATCH OBSERVATIONS OF SATELLITES, OCTOBER 1971
R. D. Eberst 14 Jan. 1972 32 p
(ROE-STS-119) Avail: NTIS HC $3.75

Stopwatch tracking observations made at stations connected with the section during October 1971 are listed in launch and time order for each satellite. Various subtotals are given.
Author (ESRO)

N72-24910# Royal Greenwich Observatory, Herstmonceux (England). Time and Latitude Service.
GREENWICH TIME REPORT Quarterly Report, Jan. - Mar.

1971
R. v. d. R. Woolley 1971 22 p
Avail: NTIS HC $3.25

Results of Greenwich time and latitude observations for the period January to March 1971 are presented. Also included are radio time signals and standard frequency emissions.
Author (ESRO)

N72-24911# Royal Aircraft Establishment, Farnborough (England).
RESONANT EFFECT ON INCLINATION FOR CLOSE SATELLITES
R. R. Allan Dec. 1971 42 p refs Presented at the 14th Intern. Astron. Union Symp., Brighton, Engl., Aug. 1970
(RAE-TR-71245; BR28094) Avail: NTIS HC $4.25

When the drag significantly exceed the resonance forces, an approximate solution was in terms of Fresnel integrals. This shows that the inclination is almost equally likely to increase or decrease, and that the total change is proportional to the time taken to pass through resonance. The effect offers a way of deriving gravity coefficients of medium order (e.g. m = 15) from the observed magnitude and shape of the variation in inclination. The magnitudes of even higher order gravity coefficients obtained from resonance with alpha = 2 (e.g. 29/2) or even with alpha = 3 (e.g. 44/3) yields information on the source depth of the high order gravity field. The effect is also used in deriving upper-atmosphere mean winds from the changes in inclination of decaying satellite orbits. Author (ESRO)

N72-24912# Rome Univ. (Italy). Inst. of Physics.
THE MECHANICS OF PARTICLES INSIDE A ROTATING CYLINDRICAL MASS SHELL
L. Pietronero 4 Feb. 1972 20 p refs
(Nota-Interna-355) Avail: NTIS HC $3.00

It is shown that up to the second order in the gravitational constant, the effect of a rotating mass shell on a particle moving near its axis is the same as that of a rotating coordinate system. Coriolis force and centrifugual force have the values expected in a rotating reference system. Author (ESRO)

N72-24913# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
SUMMER STUDY GROUP Final Report, 1 Apr. 1969 - 30 Jun. 1970
Bernard F. Burke Feb. 1972 44 p
(Contract N00014-67-A-0204-0033)
(AD-737689) Avail: NTIS CSCL 03/7

Contents: Very long-baseline interferometry; Radar holography; Atmospheric and Surface studies; Education; Technology upgrading; Other applications; VLBI navigation systems. GRA

31 SPACE VEHICLES

Includes launch vehicles; manned space capsules; clustered and multistage rockets; satellites; sounding rockets and probes; and operating problems. For basic research see: 30 Space Sciences. For related information see also: 28 Propulsion Systems; and 32 Structural Mechanics.

N72-24914 Princeton Univ., N.J.
OPTIMAL ASTRONAUTICAL GUIDANCE Ph.D. Thesis
Alain Lucien Kornhauser 1971 227 p
Avail: Univ. Microfilms Order No. 71-23366

Minimum-propellant guidance laws for application to onboard impulsive and finite-thrust spacecrafts are developed. It is assumed that the spacecraft remains in the neighborhood of a predetermined optimal trajectory and further that its initial deviation is known deterministically. The cost of the trajectory is in terms of the propellant required to complete the mission. Minimization of the first-order variation in cost between the perturbed and nominal trajectories provides the admissible guidance strategies as follows: (1) the augmentation of the nominal impulses in the impulsive case, i.e., small changes in magnitude, direction, and timing of the nominal impulses, and (2) small changes in the thrust-on, thrust-off times and small rotations in the thrust vector in the finite-thrust case. These admissible corrections are found to be sufficient to control the spacecraft if the remaining portion of the trajectory contains at least two impulses or two finite burns. Dissert. Abstr.

N72-24915*# Boeing Co., Huntsville, Ala. Aerospace Group.
SPACE TUG AEROBRAKING STUDY. VOLUME 1: EXECUTIVE SUMMARY Final Report
C. J. Corso and C. L. Eyer 12 Apr. 1972 40 p refs
(Contract NAS8-27501)
(NASA-CR-123641; D5-17142-Vol-1) Avail: NTIS HC $4.00 CSCL 22B

The feasibility and practicality of employing an aerobraking trajectory for return of the reusable space tug from geosynchronous orbit was investigated. The aerobraking return trajectory modes employ transfer ellipses from high orbits which have low perigee altitudes wherein the earth's sensible atmosphere provides drag to reduce the tug return delta velocity requirements and thus decrease the required return trip propulsive energy. Aerodynamics, aerothermodynamics, trajectories, guidance and control, configuration concepts, materials, weights and performance were considered. Sensitivities to trajectory uncertainties, atmospheric anomalies and reentry environments were determined. New technology requirements and future studies required to further enhance the aerobraking potential were identified. Author

N72-24916*# Martin Marietta Corp., Denver, Colo.
SPACE SHUTTLE PROPULSION SYSTEMS ON-BOARD CHECKOUT AND MONITORING SYSTEM DEVELOPMENT STUDY (EXTENSION). VOLUME 2: GUIDELINES FOR INCORPORATION OF THE ONBOARD CHECKOUT AND MONITORING FUNCTION ON THE SPACE SHUTTLE
Apr. 1972 79 p refs
(Contract NAS8-25619)
(NASA-CR-123570; MCR-72-41-Vol-2) Avail: NTIS HC $6.00 CSCL 22B

Guidelines are presented for incorporation of the onboard checkout and monitoring function (OCMF) into the designs of the space shuttle propulsion systems. The guidelines consist of and identify supporting documentation; requirements for formulation, implementation, and integration of OCMF; associated compliance verification techniques and requirements; and OCMF terminology and nomenclature. The guidelines are directly applicable to the incorporation of OCMF into the design of space shuttle propulsion systems and the equipment with which the propulsion systems interface. The techniques and general approach, however, are also generally applicable to OCMF incorporation into the design of other space shuttle systems. Author

N72-24917*# LTV Aerospace Corp., Dallas, Tex.
ADVANCED SMALL LAUNCH VEHICLE STUDY Final Report, May 1971 - Feb. 1972
G. E. Reins and J. F. Alvis 8 Mar. 1972 230 p refs
(Contract NAS1-10848)
(NASA-CR-112054; T186-1) Avail: NTIS HC $13.50 CSCL 16D

A conceptual design study was conducted to determine the most economical (lowest cost/launch) approach for the development of an advanced small launch vehicle (ASLV) for use over the next decade. The ASLV design objective was to place a 340 kg (750 lb) payload into a 556 km (300 n.mi.) circular orbit when launched due east from Wallops Island, Virginia. The investigation encompassed improvements to the current Scout launch vehicle; use of existing military and NASA launch vehicle stages; and new, optionally staged vehicles. Staging analyses included use of liquid, solid, and hybrid propellants. Improvements

in guidance, controls, interstages, telemetry, and payload shroud were also considered. It was concluded that the most economical approach is to progressively improve the Scout launch vehicle in three phased steps which are discussed. Author

N72-24918*# Martin Marietta Corp., Denver, Colo.
METHODOLOGY FOR THE SYSTEMS ENGINEERING PROCESS. VOLUME 2: TECHNICAL PARAMETERS
James H. Nelson Mar. 1972 45 p
(Contract NAS8-27567)
(NASA-CR-61381; MCR-71-352) Avail: NTIS HC $4.25 CSCL 22B

A scheme based on starting the logic networks from the development and mission factors that are of primary concern in an aerospace system is described. This approach required identifying the primary states (design, design verification, premission, mission, postmission), identifying the attributes within each state (performance capability, survival, evaluation, operation, etc), and then developing the generic relationships of variables for each branch. To illustrate this concept, a system was used that involved a launch vehicle and payload for an earth orbit mission. Examination showed that this example was sufficient to illustrate the concept. A more complicated mission would follow the same basic approach, but would have more extensive sets of generic trees and more correlation points between branches. It has been shown that in each system state (production, test, and use), a logic could be developed to order and classify the parameters involved in the translation from general requirements to specific requirements for system elements. Author

N72-24919*# Chrysler Corp., New Orleans, La. Space Div.
AERODYNAMIC STABILITY AND DRAG CHARACTERISTICS OF THE MSFC PRESSURE FED BOOSTER CONFIGURATIONS AT MACH NUMBERS FROM 0.9 TO 5.0 SADSAC/Space Shuttle Wind Tunnel Test Data Report
John Baker Apr. 1972 222 p
(Contract NAS8-4016)
(NASA-CR-120038; DMS-DR-1226) Avail: NTIS HC $13.25 CSCL 22B

Experimental aerodynamic investigations were conducted in the NASA/MSFC 14 x 14 Inch Trisonic Wind Tunnel during January 1972 on 0.003366 and 0.00419 scale models of the MSFC space shuttle pressure fed booster configurations. The configurations tested were a 40 deg cone/cylinder/13 deg flare with and without fins, a 40 deg cone/cylinder/13 deg flare/9 deg flare with and without fins, a 35 deg cone/cylinder with and without fins, a 35 deg cone/cylinder/7 deg flare and a 35 deg cone/cylinder with straight extension. Six component aerodynamic force and moment data were recorded over a Mach number range of 0.9 to 5.0. Model angle of attack range was -10 to +10 deg and +20 to 80 at 0 deg sideslip. Model sideslip range was -10 to +10 deg at nominal angles of attack of 0, 30 and 51 deg Author

N72-24920*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Propulsion Div.
SOLID PROPULSION ADVANCED CONCEPTS
Y. Nakamura and J. I. Shafer 2 May 1972 79 p refs
(Contract NAS7-100)
(NASA-CR-126545; JPL-TM-33-534) Avail: NTIS HC $6.00 CSCL 22B

The feasibility and application of a solid propulsion powered spacecraft concept to implement high energy missions independent of multiplanetary swingby opportunities are assessed and recommendations offered for future work. An upper stage, solid propulsion launch vehicle augmentation system was selected as the baseline configuration in view of the established program goals of low cost and high reliability. Spacecraft and propulsion system data that characterize mission performance capabilities were generated to serve as the basis for subsequent tradeoff studies. A cost effectiveness model was used for the preliminary feasibility assessment to provide a meaningful comparative effectiveness measure of the various candidate designs. The results substantiated the feasibility of the powered spacecraft concept when used in conjunction with several intermediate-sized launch vehicles as well as the existence of energy margins by which to exploit the attainment of extended mission capabilities. Additionally, in growth option applications, the employment of advanced propulsion systems and alternate spacecraft approaches appear promising. Author

N72-24921*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PREDICTING SPACECRAFT SELF-CONTAMINATION IN SPACE AND IN A TEST CHAMBER
John J. Scialdone Washington May 1972 16 p refs
(NASA-TN-D-6682; G-1053) Avail: NTIS HC $3.00 CSCL 22B

The self-contamination of spacecraft (defined as the return and deposition of outgassed molecules on its critical surfaces, either in orbit or while undergoing vacuum) is considered. Theoretical relations for the flux, density, and pressure of the emitted gas as a function of altitude, radius, and distance from the spacecraft surface are developed. The flux of the outgassed molecules that return to the emitting surface is also obtained and shown to be dependent on altitude, spacecraft dimensions, and the magnitude of outgassing. The rate of condensation and the time for the formation of a monolayer of the returning molecules can be calculated. The self-contamination of spacecraft undergoing vacuum chamber test is also theoretically examined and compared with the equivalent parameters for orbit conditions. It is concluded that, depending on the dimensions of the spacecraft relative to those of the chamber and the wall capture coefficient, ground tests conducted in the more usual space simulation chambers can provide returning fluxes and self-contamination comparable to those occurring in space up to an altitude of about 400 km. For higher altitudes and return fluxes less than 0.001 of those emitted, the chamber test can produce a greater contamination. In this case, the ground results can be related to those obtained in space, provided that the wall capture coefficient is known or if the ratio of returned to emitted flux at the spacecraft surface is measured. Author

N72-24922*# Applied Dynamics Research Corp., Huntsville, Ala.
NATURAL FREQUENCIES OF AN ORBITING SPACE STATION
Edward L. Bernstein 8 May 1972 30 p refs Backup document for AIAA Synoptic scheduled for publication in Journal of Spacecraft and Rockets in Sep. 1972
(Contract NAS8-20082)
(NASA-CR-123557) Avail: NTIS HC $3.50 CSCL 22B

The technique of modal synthesis is applied to find the natural frequencies of space stations. The station is modeled as an assemblage of rigid modules, joined by massless elastic constraints, and flexible modules characterized by deformation functions. The equations of motion are derived and system mass and stiffness matrices derived. The method is applied to the Skylab orbiting space station. The frequencies of the lowest 65 modes are given and selected mode shapes illustrated. The technique is feasible for analysis of a complex system and suitable for response studies including damping and attitude control system effects. Author

N72-24923# Committee on Science and Astronautics (U. S. House).
REVIEW OF RECENT LAUNCH FACILITIES
Washington GPO Oct. 1971 22 p Presented to Comm. on Sci. and Astronaut., 92d Congr., 1st Sess., 1 Oct. 1971
Avail: Subcomm. on NASA Oversight

A report on the Centaur launch vehicle program and on the ATS D, OAO B, Mariner 8 mission failures is presented. The findings and recommendations of the Gabriel Board on the Centaur program philosophy, procedures, and practices are

summarized. The Board strongly recommends that an aggressive and creative policy be adopted for the improvement of Atlas/Centaur quality and workmanship. Among the conclusions of the House Committee are the following: The decision not to attempt a recovery program for the Mariner mission seems justified. The decision not to attempt a recovery program for OAO B is questioned; the Committee is under the impression that NASA is so anxious to undertake expensive new projects, particularly HEAO, that it is prepared to abandon large-scale investment in the OAO project. The Committee recommends regular, thorough, and general audits of all unmanned launch vehicles with more guidance and supervision from NASA Headquarters on quality control and reliability. The problems of the Centaur stage seem serious enough to justify a broad scale, independent examination by disinterested experts. N.E.N.

N72-24924# National Environmental Satellite Center, Washington, D.C.

MODIFIED VERSION OF THE IMPROVED TIROS OPERATION SATELLITE (ITOS D-G)

A. Schwalb Apr. 1972 52 p refs

(NOAA-TM-NESS-35) Avail: NTIS HC $4.75

The modified ITOS Spacecraft system will become operational in mid-1972, with the launch of ITOS-D. The spacecraft, though similar in outward appearance to previous ones in this series, will contain new sensors. Cameras are no longer a part of the sensor complement; a very high resolution radiometer and vertical temperature profile radiometer will be flown for the first time. General information about the spacecraft, its orbit and its sensor complement is presented. Specific details on the real time data links are included for those planning to receive these data from the spacecraft. Author

N72-24925*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ATLAS-CENTAUR AC-17 PERFORMANCE FOR APPLICATIONS TECHNOLOGY SATELLITE ATS-D MISSION

Washington May 1972 148 p ref

(NASA-TM-X-2525; E-6510) Avail: NTIS HC $3.00 CSCL 22A

The Atlas-Centaur launch vehicle (AC-17) with Applications Technology Satellite-D (ATS-D) was launched from Cape Kennedy in August 1968. Mission objectives were not achieved because the Centaur main engine failed to start for the second powered phase. An evaluation is reported of the performance of the Atlas-Centaur systems, from lift off through the Centaur restart attempt. A brief analysis of the Centaur failure is included. Author

N72-24926*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

BALLISTIC RANGE MEASUREMENTS OF THE DRAG AND STATIC AND DYNAMIC STABILITY OF A RECOVERABLE SPACE SHUTTLE BOOSTER VEHICLE

Peter F. Intrieri and Donn B. Kirk May 1972 35 p refs

(NASA-TM-X-62124) Avail: NTIS HC $3.75 CSCL 22B

An experimental study has been conducted to determine the aerodynamic characteristics of a proposed recoverable space shuttle booster vehicle. Tests were made at Mach numbers of 0.7, 1.5, and 3.5 of two configurations, one with tail panels deflected 90 deg and one with tail panels deflected 70 deg. Both configurations were found to be highly statically stable at all Mach numbers. The dynamic behavior was erratic; the models exhibited both neutral dynamic stability and dynamic instability, and the motions experienced during free flight at the subsonic Mach number were very irregular. The flow field over the models was characterized by an extensive separated flow region which largely encompassed the tail panels. The experimental drag and static stability were not well predicted by available theoretical estimates. Author

N72-24927*# Translation Consultants, Ltd., Arlington, Va.

SOVIET ROBOTS ON THE MOON

A. D. Podolskiy Washington NASA Jun. 1972 16 p refs Transl. into ENGLISH from Weltraumfahrt Raketentech., v. 22, Oct. - Nov. 1971 p 171-175

(Contract NASw-2038)

(NASA-TT-F-14300) Avail: NTIS HC $3.00 CSCL 22C

Luna 16 explored the Sea of Fertility in 1970, for age, type of soil, color, density, etc. Soil samples were returned to earth for study for the first time, and confirmed that the plains were flooded by lava. Lunokhod 1, landed by Luna 17 in November 1970, confirmed the theory of the formation of the lunar crust by its experiments near the edge of the western section of Mare Imbrium. Lunokhod 1, a self-propelled laboratory on wheels, explored over 10 km over a period of 10 months prior to ceasing operation. Experiments ranged from determining bearing capacity of the surface, mechanical properties, and soil analysis, to the study of the decrease in the intensity of cosmic radiation, proton eruptions, X-ray radiation, the exploration of distant regions of space by X-ray telescope, and joint experiments with the French with a laser reflector. Author

N72-24928*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

APOLLO EXPERIENCE REPORT: ABORT PLANNING

Charles T. Hyle, Charles E. Foggatt, and Bobbie D. Weber Washington Jun. 1972 35 p

(NASA-TN-D-6847; MSC-S-307) Avail: NTIS HC $3.00 CSCL 22C

Definition of a practical return-to-earth abort capability was required for each phase of an Apollo mission. A description of the basic development of the complex Apollo abort plan is presented. The process by which the return-to-earth abort plan was developed and the constraining factors that must be included in any abort procedure are also discussed. Special emphasis is given to the description of crew warning and escape methods for each mission phase. Author

N72-24929# Lockheed Missiles and Space Co., Palo Alto, Calif.

PROGNOZ IN ORBIT

20 May 1972 3 p Transl. into ENGLISH of TASS rept.; from Pravda (Moscow), no. 141(19649), 20 May 1972

Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The flight and instrumentation of the Prognoz satellite and observations of the sun and its influence on the earth are reviewed. Instruments are described for gathering data on solar flares, wind, cosmic rays, and X-ray, gamma, and radio radiation. The observatory was launched 14 April 1972 into an orbit with an apogee of 200,000 km and a perigee of 950 km. The initial data indicate that the sun ejects an enormous quantity of charged particles during each flare. The average solar wind velocity since launch is 300 km/sec, the magnetic field intensity is 6 to 8 gamma, and the primary cosmic radiation flux is 4.8 particles/sq cm/sec. N.E.N.

N72-24930*# Radio Corp. of America, Princeton, N.J. Astro Electronics Div.

ATMOSPHERE EXPLORER (AE) SPACECRAFT SYSTEM DESCRIPTION

30 Mar. 1972 46 p

(Contract NAS5-11432)

(NASA-CR-122424; AED-R-3816F) Avail: NTIS HC $4.50 CSCL 22B

The principal design and performance characteristics of the AE spacecraft system designed to support the Atmosphere Explorer C, D, and E missions are summarized. It has been prepared for the information of experimenters and other participants in the Atmosphere Explorer program as a general guide for design and operational planning. The description represents the spacecraft system as defined at the conclusion of the interface definition study. Author

N72-24931# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
STOPWATCH OBSERVATIONS OF SATELLITES, NOVEMBER 1971
R. D. Eberst 9 Feb. 1972 28 p
(ROE-STS-120) Avail: NTIS HC $3.50

Stopwatch observations made at stations connected with the section during November 1971 are listed in launch and time order for each satellite. Various subtotals are given.

Author (ESRO)

N72-24932# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
STOPWATCH OBSERVATIONS OF SATELLITES, JANUARY 1972
R. D. Eberst 20 Mar. 1972 20 p
(ROE-STS-122) Avail: NTIS HC $3.00

Stopwatch observations made at stations connected with the section during January 1972 are listed in launch and time order for each satellite. Various subtotals are given.

Author (ESRO)

N72-24933# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
STOPWATCH OBSERVATIONS OF SATELLITES, DECEMBER 1971
R. D. Eberst 10 Mar. 1972 28 p
(ROE-STS-121) Avail: NTIS HC $3.50

Stopwatch observations made at stations during December 1971 are listed in launch and time order for each satellite. Various subtotals are given. Author (ESRO)

32 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; thermal stress; impact phenomena; vibration; flutter; inflatable structures; and structural tests. For related information see also: 17 Materials, Metallic; and 18 Materials, Nonmetallic.

N72-24934# Advisory Group for Aerospace Research and Development, Paris (France).
NONDESTRUCTIVE TESTING AND INSPECTION APPLIED TO COMPOSITE MATERIALS AND STRUCTURES
Feb. 1972 34 p refs Presented at 32d AGARD Structures and Mater. Panel Meeting, London, 31 Mar. 1971
(AGARD-R-590) Avail: NTIS HC $3.75

Papers on nondestructive testing applied to specimens and structural parts made of composite materials are presented. Various methods for failure inspection in carbon fiber composites and the possibilities and limitations of nondestructive inspection for quality control of airframes made of boron composites are discussed. For individual titles, see N72-24935 through N72-24936.

N72-24935# Cranfield Inst. of Technology (England).
NONDESTRUCTIVE TESTING OF CARBON FIBRE REINFORCED POLYMERS
C. N. Owston *In* AGARD Nondestructive Testing and Inspection Applied to Composite Mater. and Structures Feb. 1972 p 1-21 Sponsored by Min. of Aviation Supply (See N72-24934 15-32)
Avail: NTIS HC $3.75

Ultrasonic, radiographic, eddy current, and acoustic emission techniques are described, and possible failure mechanisms, especially in fatigue, are discussed. It is concluded that nondestructive testing of carbon fiber composites is feasible. Care must be exercised in realizing that composites are not metals, and the interpretation of the indicators may be different. There are few case histories of failure with composites and predictions of the importance of defects is less certain than for metals. In general, variations in the fibrous part of the composite are easy to locate and predictions of failure are easier to make. Techniques for looking at the matrix are not so good and there is less confidence in nondestructive testing where the performance of the component is markedly matrix dependent. Author

N72-24936# Air Force Materials Lab., Wright-Patterson AFB, Ohio. Advanced Composites Div.
NONDESTRUCTIVE INSPECTION PRACTICES USED IN PRODUCTION OF COMPOSITE AIRFRAME STRUCTURES
E. H. Jaffe *In* AGARD Nondestructive Testing and Inspection Applied to Composite Mater. and Structures Feb. 1972 p 23-31 (See N72-24934 15-32)
Avail: NTIS HC $3.75

The possibilities and limitations of nondestructive inspection (NDI) applied to the quality control of a primary structural part made of boron composite are described. The NDI is discussed using typical first generation high modulus composite aircraft empennage structures as examples of current practices in airframe production. The following subjects are discussed: (1) the most frequently occurring defects in manufacture of composite structures; (2) major NDI techniques currently available, and their limitations; (3) some newer techniques, and how they will fill the gap; and (4) problems of acceptance/rejection criteria, and how these decisions may be quantified. Author

N72-24937*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
COMPUTER ANALYSIS OF TWO-DIMENSIONAL FATIGUE FLAW-GROWTH PROBLEMS
Royce G. Forman, Herbert C. Kavanaugh, and Bernard Stuckey Feb. 1972 64 p refs
(NASA-TM-X-58086; MSC-06006) Avail: NTIS HC $5.25 CSCL 20L

A description is given of a computer program for analyzing the crack propagation in cyclic loaded structures. By using equations for the stress intensity factors for surface and embedded flaws, the capability of ascertaining lengthwise crack growth as well as crack growth through the thickness of the structure was determined. Equations used are written in general form so that many other types of crack growth problems, such as through the thickness type cracks, can be analyzed. Provisions have been made in the computer program to analyze crack growth for repeated blocks of variable-amplitude fatigue load spectra. Additional features of the computer program include a variable print interval and a variable integration interval to minimize computer printout and computer run time. A source listing and instructions for using the computer program are included. Author

N72-24938*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE EXACT SOLUTION OF THE MONOENERGETIC TRANSPORT EQUATION FOR CRITICAL CYLINDERS
Robert M. Westfall and Dale R. Metcalf (Va. Univ.) May 1972 17 p refs Presented at 18th Ann. Meeting of Am. Nucl. Soc., Las Vegas, Nev., 18-22 Jun. 1972
(NASA-TM-X-68061; E-6925) Avail: NTIS HC $3.00 CSCL 20K

An analytic solution for the critical, monoenergetic, bare, infinite cylinder is presented. The solution is obtained by modifying a previous development based on a neutron density transform and Case's singular eigenfunction method. Numerical results for critical radii and the neutron density as a function of position are included and compared with the results of other methods. Author

N72-24939*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A METHOD FOR THE MEASUREMENT AND ANALYSIS

OF RIDE VIBRATIONS OF TRANSPORTATION SYSTEMS
John J. Catherines, Sherman A. Clevenson, and Harland F. Scholl Washington May 1972 32 p refs
(NASA-TN-D-6785; L-8206) Avail: NTIS HC $3.00 CSCL 20K

The measurement and recording of ride vibrations which affect passenger comfort in transportation systems and the subsequent data-reduction methods necessary for interpreting the data present exceptional instrumentation requirements and necessitate the use of computers for specialized analysis techniques. A method is presented for both measuring and analyzing ride vibrations of the type encountered in ground and air transportation systems. A portable system for measuring and recording low-frequency, low-amplitude accelerations and specialized data-reduction procedures are described. Sample vibration measurements in the form of statistical parameters representative of typical transportation systems are also presented to demonstrate the utility of the techniques. Author

N72-24940*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ATM/CABLE ARCH AND BEAM STRUCTURAL TEST PROGRAM
J. A. Housley Jan. 1972 108 p
(NASA-TM-X-64657) Avail: NTIS HC $7.50 CSCL 20K

The structural testing is described of an Apollo Telescope Mount (ATM) cable arch and beam assembly, using static loads to simulate the critical conditions expected during transportation and launch of the ATM. All test objectives were met. Stress and deflection data show that the assembly is structurally adequate for use in the ATM. Author

N72-24941*# Boeing Co., Seattle, Wash. Aerospace Group.
DEVELOPMENT OF CRYOGENIC PRD-49-1 FILAMENT-WOUND TANKS
J. T. Hoggatt Dec. 1971 198 p refs
(Contract NAS3-13330)
(NASA-CR-120835) Avail: NTIS HC $12.00 CSCL 13D

A high modulus polymeric fiber was evaluated as a reinforcement for filament wound pressure vessels. Winding parameters and design data were established for the fiber with two different epoxy resin systems. Comparison was made between the performance factors of the polymeric fiber and those of S-glass and high modulus graphite vessels. Author

N72-24942*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EVALUATION OF BORON-EPOXY-REINFORCED TITANIUM TUBULAR TRUSS FOR APPLICATION TO A SPACE SHUTTLE BOOSTER THRUST STRUCTURE
Nicholas Corvelli and Robert Carri Washington Jun. 1972 49 p refs
(NASA-TN-D-6778; L-8015) Avail: NTIS HC $3.00 CSCL 20K

Results of a study to demonstrate the applicability of boron-epoxy-composite-reinforced titanium tubular members to a space shuttle booster thrust structure are presented and discussed. The experimental results include local buckling of all-composite and composite-reinforced-metal cylinders with low values of diameter-thickness ratio, static tests on composite-to-metal bonded step joints, and a test to failure of a boron-epoxy-reinforced titanium demonstration truss. The demonstration truss failed at 118 percent of design ultimate load. Test results and analysis for all specimens and the truss are compared. Comparing an all-titanium design and a boron-epoxy-reinforced-titanium (75 percent B-E and 25 percent Ti) design for application to the space shuttle booster thrust structure indicates that the latter would weigh approximately 24 percent less. Experimental data on the local buckling strength of cylinders with a diameter-thickness ratio of approximately 50 are needed to insure that undue conservatism is not used in future designs. Author

N72-24943# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
SOIL-TIRE MODEL FOR THE ANALYSIS OF OFF-ROAD TIRE PERFORMANCE
L. L. Karafiath May 1972 33 p refs
(RM-541) Avail: NTIS HC $3.75

The analysis of off-road tire performance by rigid wheel models yields acceptable results only when the tire is stiff relative to the soil. In cases where the tire stiffness is low relative to the ground it is necessary to consider the effect of tire deformation on soil-tire interaction. A study of available experimental data showed that tire deformation limits the maximum pressure that can develop in the soil under the tire load. On this basis a soil-tire model has been developed that takes the effects of tire deflection into account. Failure conditions in the soil govern the interface stresses where these do not exceed a limit pressure established on the basis of tire deflection; the interface stresses are calculated with consideration of the deflected tire geometry. In the center flat portion of the tire where hypothetical soil pressure calculated from soil failure conditions would exceed the limit, the pressure is assumed to equal the limit pressure. Sample computations show good agreement with experimental results in regard to tire deflection and performance characteristics. Author

N72-24944*# Rocketdyne, Canoga Park, Calif.
LIFE PREDICTION OF EXPULSION BLADDERS THROUGH FATIGUE TEST AND FOLD STRAIN ANALYSIS
Hugh N. Chu and Walter Unterberg May 1972 17 p refs To be presented at NATO Conf. on Reliability Testing and Reliability Evaluation, The Hague, 4-8 Sep. 1972
(Contract NAS7-506)
(NASA-CR-126658) Avail: NTIS HC $3.00 CSCL 20K

Cycle life data are presented in terms of true maximum strain for four metals, two plastics, and two elastomers. The Coffin-Manson fatigue theory was applied for metals and plastics, and cut-growth fatigue theory for elastomers. The data are based on measurements made at room and elevated temperatures. It was found that double folds give rise to far severer folding strains than do simple folds. It was also found that, except for the elastomers, all the bladder materials develop surface cracks due to double folds after only one cycle. The findings indicate that metals, which are bets for permeation resistance, are worst for fatigue resistance, and vice versa for elastomers. The intermediate plastics were found to be unsatisfactory for both permeation and fatigue resistance for missions of extended duration. D.L.G.

N72-24945# Lockheed Missiles and Space Co., Palo Alto, Calif.
ELASTIC STRAIN OF A PLATE SUBJECTED TO A WEAK SPHERICAL SHOCK IN A COMPRESSIBLE FLUID
V. D. Kubenko 1972 4 p refs Transl. into ENGLISH from Dokl. Acad. Nauk Ukr. RSR, Ser. A (Kiev) no. 3, 1972 p 237-240
Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The problem of the interaction between a thin infinite plate covered by an ideal fluid half space and a nonstationary spherical wave was considered and the mathematical solution is presented. Author

N72-24946# Sandia Labs., Albuquerque, N.Mex.
FREQUENCY RESPONSE OF A RING STIFFENED INFINITE CYLINDRICAL SHELL IMMERSED IN A FLUID MEDIUM
J. W. Berglund Feb. 1972 39 p refs
(SC-RR-710862) Avail: NTIS

Equations are derived for the axisymmetric dynamic response of a cylindrical shell immersed in a fluid subjected to a harmonic driving pressure. The shell is infinitely long and is periodically supported by flexible, massless, ring stiffeners. The governing equations also provide for initial membrane stresses in the axial and circumferential directions. Solutions are given for the radiated power as well as for the forced vibration of the shell in vacuo. Numerical results are presented for both adiprene and steel shells immersed in water and are discussed in relation to previous investigations. Author

N72-24947# Institut Franco-Allemand de Recherches, St. Louis (France).

CALCULATION OF CONSTRAINTS AND DEFORMATIONS IN STATIC LOADS SHELLS [CALCUL DES CONTRAINTES ET DES DEFORMATIONS DE COQUES CHARGEES STATIQUEMENT]

G. Meyer 21 Jul. 1971 75 p ref In FRENCH
(Contract DTEN-71.70.185)
(ISL-18/71) Avail: NTIS HC $5.75

Stress and deformation of spherical shells with constant thickness and uniform loading were computed for shells whose thickness was small compared with the radius. Two computation methods were used: in the first method the initial equations were simplified by assuming that the deflection momenta rapidly decrease from the edges to the center. If the opening of the shell is large the results are good for the external third of the shell and compare with the experimental results. The second method involves the solution of the initial system; this solution is time consuming and the numerical analysis requires a computer. However the results are valid for the full surface of the shell even for very different curvatures. This method enables the calculation of the deformation of the shell and therefore the rise of camber in the center which is a valuable parameter since it can easily be measured. Author (ESRO)

N72-24948# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

RESPONSE OF NONLINEAR SYSTEMS TO RANDOM EXCITATION. BIBLIOGRAPHIC ANALYSIS Ph.D. Thesis - Paris Univ., Orsay [LA REPONSE DES SYSTEMES NON LINEAIRES AUX EXCITATIONS ALEATOIRES. MISE AU POINT BIBLIOGRAPHIQUE]

Jean Lemaitre 1971 18 p refs In FRENCH; ENGLISH summary
(ONERA-NT-186) Avail: NTIS HC $3.00

Principal methods for solving the problem of the excitation of nonlinear systems by random processes are described. The Fokker-Planck equation gives the exact solution for Markov processes and for excitation having special stochastic properties. In the case of weak nonlinearities, approximate methods such as the perturbation method, the equivalent linearization method, and the Crandall particular method, can be used. In the case of strong linearities, to solve problems on visco-plasticity, fatigue, and crack propagation under random loading, a particular differential equation can be treated by a semi-experimental method. Author (ESRO)

N72-24949# Southampton Univ. (England). Inst. of Sound and Vibration Research.

MECHANICAL IMPEDANCE MEASUREMENT BY THE TRANSIENT LOADING TECHNIQUE

P. J. Holmes Jan. 1972 113 p refs Sponsored by Min. of Defence
(ISVR-TR-53) Avail: NTIS HC $7.75

The procedure of mechanical impedance measurement by the transient loading technique is considered with particlar reference to the accuracy obtained. It is seen that the accuracy is affected principally by three factors: the analogue to digital conversion process, the choice of record length and frequency resolution, and the method of excitation. These effects are investigated theoretically and experimentally and it is seen that extremely accurate data can be obtained if the conditions are chosen carefully. The excitation method is investigated in order to reduce the time required for setting up equipment for impedance measurements on built-up structures and it is shown that a simple hand held exciter yields acceptable test results for typical structures, but that a modified technique is desirable for light structures. Good results are obtained from tests on a model structure by the use of a probe withdrawal technique. Finally the possibilities of digital signal processing techniques are considered. Author (ESRO)

N72-24950# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugzeugbau.

BEOS: A FORTRAN 4 PROGRAM FOR CALCULATING THE BUCKLING LOADS OF ECCENTRICALLY ORTHOTROPIC SANDWICH SHELLS. DESCRIPTION AND USERS' GUIDE [BEOS EIN FORTRAN 4 - PROGRAMM ZUR BERECHNUNG DER BEULLASTEN EXZENTRISCH ORTHOTROPER SANDWICHSCHALEN PROGRAMM-BESCHREIBUNG UND BENUTZUNGSANLEITUNG]

Marie-Luise Diestelmann, Bodo Geier, Klaus Rohwer, and Juergen Schulz 1972 148 p refs In GERMAN; ENGLISH summary
(DLR-MITT-72-08) Avail: NTIS HC $9.50; DFVLR, Porz 32, 50 DM

With the aid of the computer-program BEOS the user is able to calculate the buckling loads of a great variety of different plates and shallow shells composed of up to three isotropic or orthotropic layers. The vertical projection of the structure may be a parallelogram or a rectangle. Various boundary conditions can be treated. The membrane-forces (direct and/or shear), may be variable over the shell area. A description of BEOS is presented as well as a user's guide. Explanations are given on how to prepare input data for a specific task and how to interpret the computer output. Instructions are included for calculating the stiffness-coefficients of a sandwich structure and for choosing the other few parameters that describe the problem. Four examples are presented for illustration, each of them including a brief description, a list of input data, and the complete output. Detailed descriptions of the different subroutines, exhaustive flow charts for the essential one, and a full scale listing of the program are included. Author (ESRO)

N72-24951# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.

EFFECT OF LOADING SYSTEM RIGIDITY ON THE INITIAL BUCKLING LOAD OF UNREINFORCED CIRCULAR CYLINDRICAL SHELLS UNDER HYDROSTATIC PRESSURE Final Technical Report

W. H. Horton and S. C. Bailey Ft. Eustis, Va. Army Air Mobility Res. and Develop. Lab., Ft. Eustis, Va. Nov. 1971 38 p refs
(Contract DA-44-177-AMC-115(T); DA Proj. 1F1-62204-a-170)
(AD-737783; SUDAAR-289; USAAVLABS-TR-69-49) Avail: NTIS CSCL 20/11

In the report, all the data pertinent to an experimental investigation of the effect of loading system rigidity on the initial buckling load of unreinforced circular cylindrical shells under hydrostatic pressure are presented. According to the commonly accepted Tsien criterion the buckling pressure should be higher in a rigid system than in a soft system. The research denies this axiom by generating strong evidence that the stiffness characteristic of the loading system does not alter the initial buckling stress, which fully supports the results obtained by Kaplan and Fung on spherical caps, by Krenzke on plastic spheres, and by Carlson, Sendelbeck, and Hoff on nickel-plated spherical shells. Author (GRA)

N72-24952# Stanford Univ., Calif.

STABILITY OF THIN WALLED UNSTIFFENED CIRCULAR CYLINDRICAL SHELLS UNDER NONUNIFORMLY DISTRIBUTED AXIAL LOAD

W. H. Horton and J. W. Cox Nov. 1971 84 p refs
(Contract DA-44-177-AMC-258(T); DA Proj. 1F1-62204-A-170)
(AD-738087; SU-SUDAER-220-Rev; USAAVLABS-TR-69-33)
Avail: NTIS CSCL 13/13

The report presents an experimental study of the stability of thin-walled circular cylindrical shells under nonuniformly distributed axial compression. Two techniques are given. The first is based on single tests of many specimens; the second, on many tests on a single specimen. The results are in excellent agreement. They demonstrate that such shells buckle when the stress at any point on their surface reaches the critical value for uniform axial compression. Author (GRA)

N72-24953# Polytechnic Inst. of Brooklyn, N.Y. Dept. of Aerospace Engineering and Applied Mechanics.
THERMAL STRESSES IN RING-REINFORCED OVAL CYLINDRICAL SHELLS
B. N. Cassenti and S. V. Nardo Oct. 1971 96 p refs
(Contract F44620-69-C-0072; AF Proj. 9782)
(AD-737542; PIBAL-71-28; AFOSR-71-2991TR) Avail: NTIS CSCL 13/13

The thermal stresses induced in ring-reinforced oval cylindrical shells, subject to various heat inputs are presented. The problem is divided into two main sections: determination of the transient and steady-state temperature distribution on the oval shell, and calculation of the resulting thermal stresses. In the temperature problem, two heating rates are considered. One is a uniform linear heat transfer rate and the second is a step-wise constant rate in the circumferential direction. Throughout the analysis temperature distributions that are a function of the circumferential coordinate only are considered. Author (GRA)

N72-24954# Massachusetts Univ., Amherst. Dept. of Civil Engineering.
DIGITAL SIMULATION OF STATIONARY GAUSSIAN LOADS
Hidekivhi Kanematsu and William A. Nash Jul. 1971 42 p refs
(Grant AF-AFOSR-1527-68; AF Proj. 9782)
(AD-737846; AFOSR-71-1859TR) Avail: NTIS CSCL 20/11

The report is concerned with a digital simulation technique for representing a non-white stationary Gaussian random process. A filtered white noise random process is obtained by passing an approximate white noise random process through linear filter. An application of this technique, several important stationary random processes including jet engine sound pressures, boundary layer pressure fluctuations, and gust loadings in atmospheric turbulence are simulated by using various types of second and first order linear filters. Author (GRA)

N72-24955# New Mexico Univ., Albuquerque. Dept. of Mechanical Engineering.
A GENERALIZED ELASTIC THEORY OF FRACTURE
F. D. Ju and Richard V. Browning Jan. 1972 84 p refs
(Grant AF-AFOSR-2135-71; AF Proj. 9782)
(AD-737844; ME-53(72)AFOSR-198; AFOSR-72-0235TR) Avail: NTIS CSCL 20/11

A theory of fracture is proposed for brittle and near brittle fracture. The theory includes the Griffith-Irwin theory as a special case. Developed for opening mode loading in plane geometry, the theory is based on a solution for a slit in an infinite elastic plate with an arbitrary relative displacement along the slit. The particular relative displacement functions are chosen and studied in detailed by calculating the mean stress, maximum shear stress, maximum tensile stress, and energy density fields as well as the tractions applied on the slit. The particular solutions chosen for examination all exhibit singularities in the stress fields at the slit end, with behavior ranging from the classical stress-free slit elastic solution to the logarithmic solutions of Ju. A stress intensity factor is proposed based on the solutions that generate fractional power singularities. This stress intensity factor is a generalization of the Irwin-Griffith factor.
Author (GRA)

33 THERMODYNAMICS AND COMBUSTION

Includes ablation, cooling, heating, heat transfer, thermal balance, and other thermal effects; and combustion theory. For related information see also: 12 Fluid Mechanics; and 27 Propellants.

N72-24956 Princeton Univ., N.J.
IGNITION OF SOLID POLYMERIC FUELS BY HOT OXIDIZING GASES PH.D. Thesis
Takashi Kashiwagi 1971 231 p
Avail: Univ. Microfilms Order No. 71-23364

In an attempt to identify the rate-controlling exothermic reaction, one dimensional conduction mode experiments with a shock tube and two dimensional convective mode experiments with a shock tunnel were performed with pure polymer and propellant specimens. The experimental data indicated the inadequacy of a model which assumes a homogeneous propellant with a single pyrolysis law at the surface. Two dimensional mathematical models describing both gas phase and surface reaction-controlled ignition of a pure fuel in an oxidizing boundary layer were developed and solved numerically. The ignitability of a polymeric fuel by a hot oxidizing gas stream was studied experimentally in a shock tunnel yielding conditions closely similar to those in the theoretical (2-D) models. It was concluded that ignition of a polymeric fuel in a hot ozidizing flow occurs mainly by means of a gas phase reaction in the boundary layer, the reactants being the oxygen of the hot gas stream and the fuel vapor evolved from the pyrolytic heating of the solid fuel
Dissert. Abstr.

N72-24957*# Pennsylvania State Univ., University Park. Dept. of Mechanical Engineering.
FUEL DROPLET BURNING RATES AT HIGH PRESSURES
G. S. Canada and G. M. Faeth [1972] 34 p refs
(Grant NGR-39-009-077)
(NASA-CR-126666) Avail: NTIS HC $3.75 CSCL 21B

Combustion of methanol, ethanol, propanol -1, n - pentane, n - heptane and n - decane was observed in air under natural convection conditions at pressures up to 100 atm. The droplets were simulated by porous spheres with diameters in the range 0.63 - 1.90 cm. The pressure levels of the tests were high enough so that near critical combustion was observed for methanol and ethanol. Measurements were made of the burning rate and liquid surface temperatures of the fuels. The data were compared with variable property analysis of the combustion process, including a correction for natural convection. The burning rate predictions of the various theories were similar and in fair agreement with the data. The high pressure theory gave the best prediction for the liquid surface temperatures of ethanol and propanol -1 at high pressure. The experiments indicated the approach of critical burning conditions for methanol and ethanol at pressures on the order of 80 - 100 atm, which was in good agreement with the predictions of both the low and high pressure analysis. Author

N72-24958*# Stanford Research Inst., Menlo Park, Calif.
THE KINETICS OF REACTION OF THE BY-PRODUCTS OF ABLATIVE MATERIALS AT HIGH TEMPERATURES AND THE RATE OF HEAT TRANSFER BETWEEN HOT SURFACES AND REACTIVE GASES Final Report
G. N. Spokes, P. C. Beadle, N. A. Gac, D. M. Golden, K. D. King, and S. W. Benson Jun. 1971 146 p refs
(Contract NAS7-472; SRI Proj. 6098)
(NASA-CR-114453) Avail: NTIS HC $9.50 CSCL 20M

Research has been conducted by means of laboratory experiments to enhance understanding of the fundamental mechanisms of heterogeneous and homogeneous chemical reactions taking place during ablative processes that accompany the reentry or manned space vehicles into planetary atmospheres. Fundamental mechanisms of those chemical reactions believed to be important in the thermal degradation of ablative plastic heat shield materials, and the gases evolved, are described.
Author

N72-24959# Advisory Group for Aerospace Research and Development, Paris (France).
ABLATION
H. Hurwicz, K. M. Kratsch, J. E. Rogan, and R. E. Wilson, ed. (NOL, White Oak, Md.) Mar. 1972 55 p refs

(AGARD-AG-161) Avail: NTIS HC $4.75

Physico-mathematical approaches to analysis of ablation processes are brought out, ranging from a simplistic heat of ablation voncept to the sophisticated analysis of laminar and turbulent flow, nonequilibrium ablation in chemically reacting flow fields, including surface reactions, and radiative heat transfer. Emphasis is given to the synergistic mechanisms occurring during ablation. Examples of nosetip interaction with the aero/thermodynamic environment at the surface and at depth are given, and striation phenomena on the afterbody are discussed. Material property and environmental effects on material performance are also reviewed, as well as the test simulation requirements. Requirements for further studies of mechanical erosion, other synergistic effects, and extension of facilities range of performance are also noted. Author

N72-24960# Advisory Group for Aerospace Research and Development, Paris (France).

THERMOPHYSICAL PROPERTIES OF SOLID MATERIALS. PROJECT SECTION 1B: THERMAL EXPANSION MEASUREMENTS FROM 1000 C TO 2600 C

E. Fitzer Feb. 1972 60 p refs

(AGARD-AR-38) Avail: NTIS HC $5.00

The thermal expansion behavior of selected materials above 1000 C was determined experimentally. Pure platinum, sintered Al2O3, sintered and arc-cast tungsten, Ta/10W alloy, and three types of polycrystalline graphites (AXM-5Q, RVD, AAQ1), each from the same original stock, were used as sample materials. Several experimental techniques, such as twin microscopic measurements, push rod methods and X-ray studies were applied. All experimental results were analyzed for the possible error causes, and conclusions were drawn with respect to the accuracy of experimental data obtained by the different methods, as well as for the suitability of the sample materials for such measurements. Author

N72-24961*# Georgia Inst. of Tech., Atlanta.

THE PREDICTION OF NONLINEAR LONGITUDINAL COMBUSTION INSTABILITY IN LIQUID PROPELLANT ROCKETS

M. E. Lores and B. T. Zinn Apr. 1972 85 p refs

(Grant NGL-11-002-083)

(NASA-CR-120904) Avail: NTIS HC $6.25 CSCL 20M

An analytical technique was developed to solve nonlinear longitudinal combustion instability problems. The analysis yields the transient and limit cycle behavior of unstable motors and the threshold amplitude required to trigger a linearly stable motor into unstable operation. The limit cycle waveforms were found to exhibit shock wave characteristics for most unstable engine operating conditions. A method of correlating the analytical solutions with experimental data was developed. Calculated results indicate that a second-order solution adequately describes the behavior of combustion instability oscillations over a broad range of engine operating conditions, but that higher order effects must be accounted for in order to investigate engine triggering. Author

N72-24962*# National Aeronautics and Space Administration, Washington, D.C.

HEAT INSULATING MATERIAL AND PROCESS FOR ITS MANUFACTURE

F. A. Marion and H. J. McSpadden May 1972 25 p Transl. into ENGLISH of "Waermeisolierender Werkstoff und Verfahren zu dessen Herstellung", German Patent Office, German class 22gs/18, 3 Sep. 1970 33 p

(NASA-TT-F-14277) Avail: NTIS HC $3.25 CSCL 20M

A heat-insulating material is described which is able to resist high temperatures of several thousands of degrees C over a period of several hours, without being destroyed. The manufacturing process is also discussed in detail. Author

N72-24963*# Michigan Univ., Ann Arbor.

TWO PHASE DETONATION STUDIES CONDUCTED IN 1971

J. A. Nicholls Apr. 1972 70 p refs

(Grant NGL-23-005-336)

(NASA-CR-120924; UM-026030-3-P) Avail: NTIS HC $5.50 CSCL 20M

A report is presented describing the research conducted on five phases: (1) ignition of fuel drops by a shock wave and passage of a shock wave over a burning drop, (2) the energy release pattern of a two-phase detonation with controlled drop sizes, (3) the attenuation of shock and detonation waves passing over an acoustic liner, (4) experimental and theoretical studies of film detonations, and (5) a simplified analytical model of a rotating two-phase detonation wave in a rocket motor. Author

N72-24964*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

RADIATIVE HEATING TO THE APOLLO COMMAND MODULE: ENGINEERING PREDICTION AND FLIGHT MEASUREMENT

R. C. Ried, W. C. Rochelle, and J. D. Milhoan Apr. 1972 57 p refs

(NASA-TM-X-58091; MSC-06834) Avail: NTIS HC $5.00 CSCL 20M

The theory and engineering techniques used for the prediction of the Apollo entry thermal-radiation environment are presented. The radiation predictions are shown to be in satisfactory agreement with the Apollo 4, FIRE 1, and FIRE 2 flight radiometer data. The characteristics and performance of the Apollo flight radiometer and ablator-mounted configuration were determined through arc jet simulation tests. Author

N72-24965*# Translation Consultants, Ltd., Arlington, Va.

THE METHANE COMBUSTION MECHANISM QUESTION. 2: THE ONE-DIMENSIONAL ATOMIC FLAME

V. Ya. Basevich, S. M. Kogarko, and G. A. Furman Washington NASA Jun. 1972 10 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Khim. (USSR), no. 10, Oct. 1971 p 2192-2196

(Contract NASw-2038)

(NASA-TT-F-14321) Avail: NTIS HC $3.00 CSCL 21B

The procedure used to obtain experimental data on the kinetics of atomic flames is discussed. A methane combustion process is suggested. Author

N72-24966# Royal Aircraft Establishment, Farnborough (England).

THE IGNITION OF EXPLOSIVE MIXTURES BY STATIC ELECTRICITY

E. Heidelberg Nov. 1971 16 p refs Transl. into ENGLISH from Proc. of 1st Intern. Conf. on Static Elec., Vienna, 4-6 May 1970

(RAE-Lib-Trans-1622; BR28902) Avail: NTIS HC $3.00

Charge on thin insulating sheets attached to an earthed metal backing may cause brush and Lichtenberg discharges which can ignite explosive mixtures. Dust/air mixtures cannot be ignited by brush discharge but surface charge densities on a plane surface can lead to discharge on earthed spheres sufficient to ignite hydrogen and hexane air mixtures respectively. A surface charge density 2.5 x 10 to the -8th power c/sq cm is required for Lichtenberg discharge, the likehood of which decreases with increasing thickness of insulation, 8mm being sufficient to prevent such discharge in the test apparatus described. Ignition by brush discharge is enhanced by increasing layer thickness, but may be prevented by limiting this 0.2 mm for hydrogen and 2 mm for hexane, with the penalty that Lichtenberg discharges will occur when the charging processes are of sufficient magnitude. Author

N72-24967# Technische Hogeschool, Delft (Netherlands). Lab. for Thermal Power Engineering.

MATHEMATICAL MODELLING OF PRESSURIZER THER-

MODYNAMICS Ph.D. Thesis
Tom Goemans Feb. 1972 340 p refs
(WTHD-34) Avail: NTIS HC $19.00

A discussion is presented of the energy exchange processes taking place in the pressurizer under both steady state and transient conditions. Consequences for the optimum configuration of the various heat sources are also discussed. A disscussion of the criteria to be used for the design of pressurizers is given. The thermodynamic processes taking place in the steam and water volumes of the pressurizer are considered. The test results are discussed and pressure and temperature responses in the pressurizer are shown for a number of single and multiple surge test runs. The background of the design code PREDESCO is presented as a number of small interactive programs to be used at the terminal for a quick determination of the required stream and water volumes, spray and relief valve flow rates, and the heater power. In order to study the response of the pressurizer on disturbances, the mathematical model NEPTUNE may be used. This model is described. A pressurizer design example is given for the case of a power plant with a 1472 MW pressurized water reactor, for which the determinant primary circuit volume variations are computed with the analog model POPLADYN.
Author

N72-24968# Aeronautical Research Labs., Melbourne (Australia).
TERMINAL SHAPES IN HYPERSONIC ABLATION
A. D. McEwan Jul. 1971 33 p refs
(ARL/A-Rept-136) Avail: NTIS HC $3.75

The terminal shapes of axisymmetric or two-dimensional bodies ablating in a hypersonic airstream were calculated on the basis of published solutions of the laminar boundary layer under conditions of heat and mass transfer. Shapes so calculated are compared with observed shapes of wax and camphor models ablated in a low enthalpy airstream. Over the frontal part of the models agreement is good, but it deteriorates as the surface slope becomes small relative to the undisturbed airstream. Calculated shapes agree well with published forms for polytetrafluorethane ablation. Author

N72-24969# Central Electricity Generating Board, Berkeley (England). Nuclear Labs.
EFFECT OF RIB SHAPE AND SPACING ON CONDUCTIVITY CORRECTIONS TO RIBBED SURFACE HEAT TRANSFER DATA
J. Watts Oct. 1971 21 p refs Submitted for publication
(RD/B/N-2106) Avail: AEC Depository Libraries

The effect of thermal conductivity on the heat transfer performance of a number of rib-roughened surfaces was computed using previously measured heat transfer coefficient distributions. The calculations show that the rig-to-reactor performance correction is smaller for some refined surfaces than for the standard AGR roughness. It follows therefore that the improvement to be obtained by using such a refined surface is greater than would at first appear from rig tests. Author (NSA)

N72-24970# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Reaktorentwicklung.
CRITERIA FOR SELECTION OF THE MEASURING FILTER AND SCANNING FREQUENCY AS WELL AS A METHOD OF CORRECTING OF MEASUREMENT ERRORS APPLIED TO TEMPERATURE MEASUREMENT IN SODIUM
G. Rittirsch Aug. 1971 29 p refs In GERMAN; ENGLISH summary
(KFK-Ext-8/71-3) Avail: AEC Depository Libraries

NiCr-Ni thermocouples selected for small dead-time and time constant were used to measure fast temperature changes in studies of boiling or superheated liquid metals. The interdependence of thermocouple, filter cutoff frequency, and filter-type and sampling frequency was investigated in connection with digital data acquisition. Results are presented from which it is possible to find the optimum layout for the analog measuring channels. Two methods are described which allow for correction of the measurement error caused by thermal inertia of the thermocouple. The application of these methods is illustrated. Author (NSA)

N72-24971# Explosives Research and Development Establishment, Waltham Abbey (England).
POLYURETHANE ELASTOMERS BASED ON HYDROXYL-TERMINATED POLYBUTADIENES
B. E. Brokenbrow, D. Sims, and J. Wright Jul. 1970 31 p refs
(ERDE-TR-20) Avail: NTIS HC $3.75

Polyurethane elastomers prepared from hydroxyl-terminated polybutadiene polymers and copolymers were assessed and compared with polyester and polyether urethanes. The effects of various diols and diamines as chain extenders and cross linking agents, and additions of carbon black to the hydroxyl-terminated polybutadienes, were also studied. Hydroxyl-terminated polybutadiene urethane elastomers showed superior hydrolytic stability to the polyester and polyether urethanes selected for comparison; on the other hand, their resistance to petroleum was less satisfactory. Author (ESRO)

N72-24972# Institut Franco-Allemand de Recherches, St. Louis (France).
EQUATION OF STATE OF THE AIR FOR PRESSURES UP TO 1000 baR AND TEMPERATURES UP TO 3000 K [EQUATION D'ETAT DE L'AIR POUR UNE PRESSION INFERIEURE A 1000 bar ET UNE TEMPERATURE INFERIEURE A 3000 K]
G. Freiss 21 Sep. 1970 26 p refs In FRENCH
(ISL-19/70) Avail: NTIS HC $3.50

The equation of state for air behind the shock wave of a nuclear explosion where pressure might be as high as 1000 bar is developed. Thermodynamic parameters such as pressure, enthalpy, and entropy of the air, considered as a mixture of oxygen and nitrogen, are calculated. The computer program is included. Author (ESRO)

N72-24973# Institut Franco-Allemand de Recherches, St. Louis (France).
ABLATION PRODUCTS IN THE FORM OF PARTICLES IN THE ORTHOSTRALON PROJECTILE WAKE [PARTIKELFOERMIGE ABLATIONSPRODUKTE IM NACHLAUF VON ORTHOSTRALONPROJEKTILEN]
H. Mach 5 Oct. 1971 31 p refs In GERMAN
(Contract DTEN-70/198)
(ISL-25/71) Avail: NTIS HC $3.75

Glass fiber reinforced synthetic resin projectiles were fired with a gas gun and the radiation of ablation products in the wake was analyzed. The continuum spectra decreased rapidly and this is attributed to the presence of luminous particles. These are studied by determining absorption and scattering coefficients of the particle cloud and their variation as function of wavelength. Photographic and photoelectric measurements were made of brightness temperature, color temperature, line inversion temperature and for two values of the wavelength, the transverse distribution of intensity and transmission. It appears that, up to a distance of 10 diameters, there are only absorptive particles with weak scattering. Beyond this distance, there are only absorptive particles and the scattering indicates that these are soot particles, the mass distribution of which is given. Author (ESRO)

N72-24974# Rocketdyne, Canoga Park, Calif.
PROPELLANT SPRAY COMBUSTION PROCESSES Annual Report, 1 Nov. 1970 - 1 Nov. 1971
Robert D. Sutton and Luther P. Combs 22 Dec. 1971 11 p refs
(Contract F44620-71-C-0003; AF Proj. 9711)
(AD-737745; AFOSR-72-0483TR; AR-1) Avail: NTIS CSCL 21/9

Information resulting from this study will allow formulation of new and very general analytical models and criteria to permit a priori design of reliable and stable liquid rocket motors and supersonic air-breathing engines required for future weapons delivery systems. Specifically, the objective of this program is the acquisition of experimental data on the mechanisms of propellant spray combustion energy addition to steady flow fields and propagating pressure disturbances. The data will be used to

evaluate expressions describing the dynamics that contribute to the coupling processes between the spray and gas flow fields. These expressions form the basis of steady-state and transient propellant combustion models that bear directly on the problem of predicting performance and the onset of high frequency combustion instability in liquid propellant rocket engines.
Author (GRA)

34 GENERAL

Includes information of a broad nature related to industrial applications and technology, and to basic research; defense aspects; information retrieval; management; law and related legal matters; and legislative hearings and documents.

N72-24975*# Massachusetts Inst. of Tech., Cambridge. Engineering Projects Lab.
A COMPUTER SIMULATION EXPERIMENT OF SUPERVISORY CONTROL OF REMOTE MANIPULATION M.S. Thesis
Simon George McCandlish Jun. 1966 81 p refs
(Grant NGL-22-009-002; Contract AF 19(628)-3317)
(NASA-CR-126662; DSR-9960-2) Avail: NTIS HC $6.25 CSCL 05H

A computer simulation of a remote manipulation task and a rate-controlled manipulator is described. Some low-level automatic decision making ability which could be used at the operator's discretion to augment his direct continuous control was built into the manipulator. Experiments were made on the effect of transmission delay, dynamic lag, and intermittent vision on human manipulative ability. Delay does not make remote manipulation impossible. Intermittent visual feedback, and the absence of rate information in the display presented to the operator do not seem to impair the operator's performance. A small-capacity visual feedback channel may be sufficient for remote manipulation tasks, or one channel might be time-shared between several operators. In other experiments the operator called in sequence various on-site automatic control programs of the machine, and thereby acted as a supervisor. The supervisory mode of operation has some advantages when the task to be performed is difficult for a human controlling directly. Author

N72-24976# Joint Publications Research Service, Arlington, Va.
SCIENCE OF ORGANIZATION AND ORGANIZATION OF SCIENCE
A. A. Malinovskiy 4 May 1972 19 p refs Transl. into ENGLISH from Priroda (Moscow), no. 3, 1972 p 42-49
(JPRS-55883) Avail: NTIS HC $3.00

Attention is being given lately to the search for the rational organization of the control of complex systems such as an enterprise, a system of interdependent enterprises, an industry, or a collection of people occupied in a common business. All these questions, roughly speaking, may be divided into two groups: qualitative and quantitative consideration of the management processes. Author

N72-24977# Council on Environmental Quality, Washington, D.C.
ENVIRONMENTAL QUALITY Annual Report
Aug. 1971 380 p
(AR-2) Avail: SOD $2.00

Two fundamental aspects of environmental quality, economics and legal developments, are examined in depth. The Federal, State, and local action, both legislative and administrative, in implementing previous recommendations or leading to proposals for legislation are discussed. The status of and trends in environmental quality and developments, particularly among the States, are reviewed. A number of environmental problems in the inner city are also described. Author

N72-24978*# George Washington Univ., Washington, D.C.
GENERATING SOCIAL IMPACT SCENARIOS, A KEY STEP IN MAKING TECHNOLOGY ASSESSMENT STUDIES
Martin V. Jones (Mitre Corp.) Apr. 1972 24 p refs
(Grant NGL-09-010-030)
(NASA-CR-126643; GWPS-Mon-11) Avail: NTIS HC $3.25 CSCL 05K

The social impact scenario, a method used to trace the effects of new technological applications, is discussed. The research seeks to anticipate the secondary social impacts that arise from: (1) government or private programs that cope with major social problems like poverty, environmental pollution, or public safety; and (2) a concerted national effort to achieve a widely supported specific goal like landing a man on the moon or finding a cure for cancer. Author

N72-24979# Civil Aeronautics Board, Washington, D.C.
HANDBOOK OF AIRLINE STATISTICS: DATA FOR INDIVIDUAL CARRIERS, 1962-1970, DATA FOR CARRIER GROUPS, 1926-1970
Jan. 1972 597 p
Avail: SOD $10.50

Statistical data are presented in tabular form for individual air carriers for the years 1962 to 1970. Carrier group data are given for 1926 through 1970. K.P.D.

N72-24980# National Academy of Sciences-National Research Council, Washington, D.C. Highway Research Board.
LOCKED-WHEEL PAVEMENT SKID TESTER CORRELATION AND CALIBRATION TECHNIQUES
Apr. 1972 5 p ref
(Digest-38) Avail: NTIS HC $3.00

The development and verification of methods for improving the ability to measure pavement skid resistance using locked wheel skid testers are discussed. Tentative recommendations for reducing variations in skid resistance measurements are presented. K.P.D.

N72-24981# Civil Aeronautics Board, Washington, D.C. Bureau of Operating Rights Standards Div.
COMMUTER AIR CARRIER TRAFFIC STATISTICS, YEAR ENDING 20 JUNE 1971
Jan. 1972 22 p
Avail: NTIS HC $3.25

Passenger, cargo, and mail statistics for commuter air carriers are presented. Compared to FY 1970 data, the number of flights decreased over 13%, the number of passengers increased 3.2%, the cargo volume increased 23%, and mail increased 18.2%. N.E.N.

N72-24982# Resource Management Corp., Inc., Bethesda, Md.
AVIATION COST ALLOCATION STUDY: FAA AIRPORT AND AIRWAY SYSTEM COST ELEMENTS
Feb. 1972 124 p Sponsored by FAA
Avail: NTIS HC $8.25

A compendium of planning factors for estimating the investment and operating costs of all elements of the FAA Airport and Airway System is presented. Unit cost data are presented for all facilities and equipments now in operation or currently being developed. While primarily developed for supporting the study of cost allocation and the user taxes of the FAA system, it was felt that the unit cost estimates would be of use to both Department of Transportation and Federal Aviation Administration officials in related policy issues as well as other interested parties. The discussion of the FAA system is separated into six functional categories: airport systems, terminal control systems, en route control systems, flight service systems, support systems, and research and development programs. Author

N72-24983# Tel-Aviv Univ. (Israel). Dept. of Environmental Sciences.
[EARTH ENVIRONMENTAL SCIENCES AND SPACE PHYSICS]
1971 120 p refs
Avail: NTIS HC $8.00

The scope of scientific activity within the Department of Environmental Sciences encompasses the areas of solid earth geophysics; seismology; meteorology; oceanography; earth resources; ionospheric, space, and planetary physics; environmental pollution; and geophysical instrumentation. Abstracts of the scientific publications by various members of the Department during 1971 are included. The year also witnessed a continued expansion in the activities of the Department. Among the new facilities are the Air Pollution Laboratory, Remote Sensing Laboratory, and Cloud Physics and Atmospheric Electricity Laboratory. These facilities are described, and activities at other laboratories are summarized. Author

N72-24984# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
STRATEGY OF SPACE RESEARCH
H. Alfven Mar. 1972 10 p ref Presented at Akad. Nauk SSSR, Moscow, 2 Mar. 1972
(TRITA-EPP-72-08) Avail: NTIS HC $3.00

Space technology, space science, and man in space are briefly discussed. Possible means of replacing chemical propulsion include plasma propulsion, nuclear propulsion, and extraction of energy from the magnetosphere and solar wind. The change in space research from the area near earth to the moon and solar system is noted, and it is felt that the investigations into the formation and evolution of the solar system will be the main efforts in the near future. It is suggested that the emphasis should change from the specific formation of planets around the sun to a general theory of the formation of secondary bodies around a central body. Exploration of asteroids, comets, and meteoroids is also mentioned. N.E.N.

N72-24985# Bechtel Corp., San Francisco, Calif.
ECONOMIC STUDIES: CAPITAL COST ANALYSIS OF AIRPORT ALTERNATIVES
Oct. 1971 160 p ref Sponsored in parts by FAA and HUD
Avail: NTIS HC $10.00

A series of airport alternative for the San Francisco Bay area was reviewed for cost and than considered on a present value basis to allow further assessments when weighed against anticipated income and other benefits. Cost data were accumulated on current and projected bases, and order-of-magnitude cost estimates were made for 37 alternative airport expansion projects at 20 airports. The expansion of general aviation airports was estimated by using existing master plans which included adding a second runway or extending an existing one, and adding taxiways, tie-down areas, aprons, or a tower. Rapid transit connections were included in commercial airport projects. The projects varied in cost because of expensive fill and diking requirements. The major components of the project are land, building construction, and heavy construction. These are considered, along with the effects of their different rates of escalation. N.E.N.

N72-24986# Flughafen, Frankfurt am Main (West Germany). Planungsabteilung.
PROBLEMS OF THE LOCATION OF AIRPORTS IN THE FEDERAL REPUBLIC OF GERMANY [DIE GEOGRAPHISCHE PROBLEMATIK DER LAGE VON FLUGPLAETZEN IN DER BRD]
Peter-Michael Gerhardt Cologne DGLR 1971 18 p refs In GERMAN Presented at the 4th DGLR Annual Meeting, Baden-Baden, West Ger., 11-13 Oct. 1971
(DGLR-Paper-71-075) Avail: NTIS HC $3.00

The optimum locations for airports and landing strips and their distance to city centers are discussed. Locations are analyzed in terms of transport facilities for passengers, accompanying parties, visitors, and airport personnel to and from airports, including railways, highways, and roads. Airports are considered as pollution centers, and noise and air pollution in the vicinity of airports are discussed. The future development of airports in Western Germany is considered. Author (ESRO)

N72-24987# Centre National d'Etudes Spatiales, Paris (France).
GENERAL INSTRUCTION CONCERNING QUALITY REQUIREMENTS OF MATERIALS USED IN BALLISTICS AND SPACE [INSTRUCTION GENERALE RELATIVE AUX EXIGENCES DE QUALITE POUR LES MATERIELS A USAGE BALISTIQUE ET SPATIAL]
Jul. 1971 72 p In FRENCH Prepared jointly with Direc. Tech. des Eng.
(CNES/QFT/IN-0001; DTEN/STEN/QM-1088) Avail: NTIS HC $5.75

Quality assurance procedures to be used by contractors in order to guarantee the quality necessary for aerospace equipment are defined. The following topics are treated in relation to quality assurance: level of personnel involved, technical documentation, product identification, suppliers, manufacturing methods, inspections and tests, nonconforming products, time schedules, maintenance, stocks, materials handling, and sampling.
Author (ESRO)

N72-24988# RAND Corp., Santa Monica, Calif.
THE MECHANICS OF FORECASTING THE COMMUNITY NOISE IMPACT OF A TRANSPORTATION SYSTEM
Jean R. Gebman Nov. 1971 20 p refs
(AD-737684; P-4735) Avail: NTIS CSCL 20/1

An overview is presented of the noise impact assessment methodology being developed to assist policy makers in evaluating the potential environmental impact of future transportation alternatives. Author (GRA)

N72-24128# Joint Publications Research Service, Arlington, Va.
HEURISTIC MODELS IN SOCIOLOGY
N. M. Amosov and D. N. Galenko *In its* Cybernetics and Computer Technol. 9 May 1972 p 14-25 refs (See N72-24126 15-05)
Avail: NTIS HC $5.50

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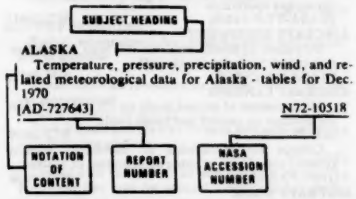

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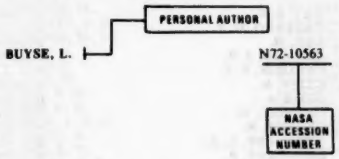

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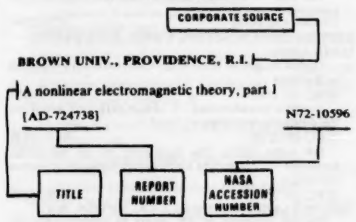

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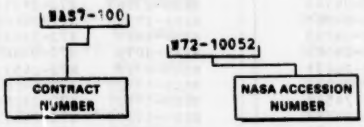

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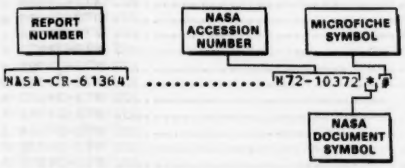

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